

green, next a broad Indian red stripe, the edges of the scales red, the centers pale greenish, a few smaller red specks; next a broad greenish stripe with greenish bars connecting with the median stripe and with narrow rosy bars crossing it connecting the rosy stripes above and below; rosy stripes along middle of side with 3 or 4 brownish blotches; the next stripe greenish, crossed by numerous narrow rosy or purplish bars; next stripe rosy, narrower than the other 2; belly whitish, top and sides of head greenish, vermiculated with rosy or purplish lines; humeral region with several roundish red spots; base of dorsal greenish, and with Indian red from invasion of body-color; middle line of dorsal rosy, with purple upper border, followed by a somewhat narrower yellow stripe, then a rosy or orange stripe, followed by a narrow white border; anal with rosy band at base, then a green band with bluish edges, then a broad pale rosy band with narrow white edge, the green band not on last 2 rays; caudal rays and membrane alternating greenish yellow and orange; pectoral dusky, greenish at base, rosy in center; ventrals pale yellow; iris brownish.

The same specimen in spirits faded to a creamy white, with 5 irregular broken dusky cross-bars; black spot on membrane of first 3 dorsal spines; soft dorsal and anal white with faint trace of greenish; top of head and nape with faint traces of dark spots and lines.

Specimen No. 03240, from which the above general description was taken, is in alcohol dusky greenish on back and top of head, the sides somewhat paler, under parts greenish white; side with about 4 or 5 irregular broken, vertical cross-bars of dark brownish or black; membranes of first 3 dorsal spines blue-black; base of dorsal narrowly pea-green, followed by a broad greenish yellow band,

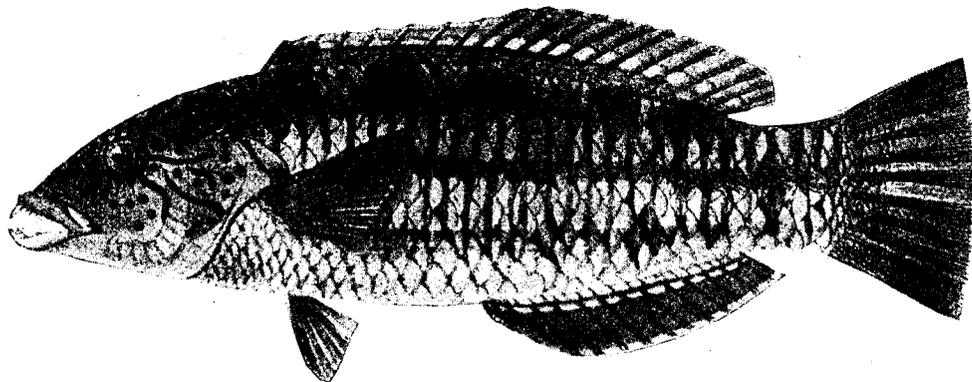


FIG. 129.—*Thalassoma umbrostigma* (Rüppell); after Bleeker.

bordered above by a narrower pea-green band, which is followed in turn by an irregular border of pale yellowish and purplish; anal scallopy green at base, followed by a broad white band, beyond which is a nearly equally broad blue-green band, which in turn is followed by a narrower yellowish white stripe, the edge of the fin pale pea-green; caudal greenish, yellowish and creamy white, dusky at base; ventrals pale creamy white; pectoral dusky yellowish at base, dusky at tip.

A smaller specimen (No. 05256), 6.25 inches long, agrees essentially with the larger ones, except that the blue-green of the head is profusely covered with small round black or brownish spots and a few lines or reticulations of the same color. Another specimen (No. 05263) shows the dark spots on the head very plainly, but ordinarily specimens of that size have those colors obscure or indistinct in spirits. In all of our numerous examples the markings are quite distinct. The species is rather abundant about the coral reefs.

Dr. Jenkins obtained 11 specimens at Honolulu, and our own collection contains 10 specimens from Honolulu, 8 from Kailua, and 2 from Hilo. These range in length from 1.5 to 10.25 inches.

Julis umbrostigma Rüppell, Neue Wirbe., Fische, 11, taf. 3, fig. 2, 1838, Mohila and Djetta; Bleeker, Atlas, I, 92, taf. 34, fig. 2, 1862; Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 506 (Honolulu and Laysan Island).

Thalassoma umbrostigma, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 463 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 529 (Laysan Island).

237. *Thalassoma duperrey* (Quoy & Gaimard). Plate XXXV and Fig. 130.

"Himalia laurilli;" "A' alaihi."

Head 3.5 in length; depth 3.4; eye 6 in head; snout 3; preorbital 4.5; interorbital 3.6; D. VII, 13; A. II, 11; scales 3-28-9.

Body rather slender, compressed, the dorsal and ventral outlines nearly equally and regularly curved from tip of snout to base of caudal peduncle; head rather small; longer than deep; mouth small, horizontal, the gape scarcely exceeding orbit, in line with axis of body; cheek oblique, not deep; interorbital space high, convex; a pair of strong canines in front of each jaw, those above usually stronger; a series of short, bluntly conic teeth on each side of jaws; fins low; origin of dorsal slightly behind base of pectoral, its distance from snout 3.2 in head; dorsal fin continuous, the anterior spines not detached nor elevated; longest dorsal spine about equal to snout, the rays equally long; anal similar to soft dorsal, their heights equal; caudal with the 3 or 4 outer rays produced, their length equal to head or nearly twice that of middle rays; scales smooth and thin, of about uniform size; a row of somewhat smaller scales sheathing bases of dorsal and anal and on base of caudal; produced caudal rays with fine scales at base; head entirely naked.

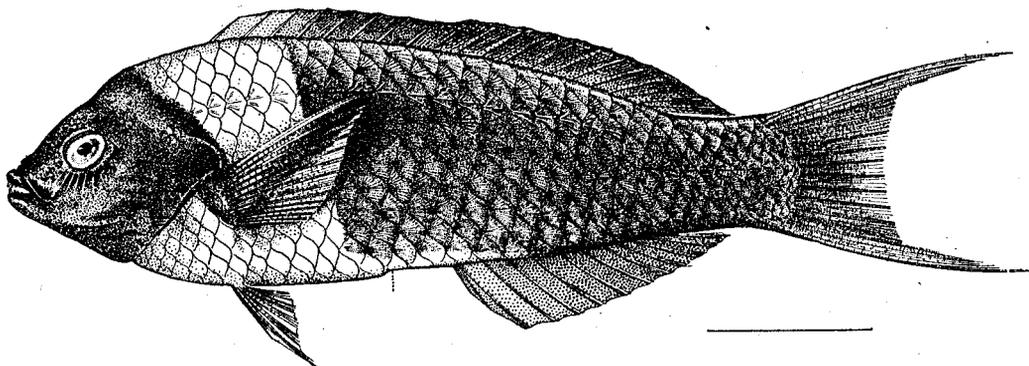


FIG. 130.—*Thalassoma duperrey* (Quoy & Gaimard). Type of *T. pyrrohinectum* Jenkins.

Color in life of a nearly fresh specimen, 6.5 inches long, taken at Honolulu, June 15, side bright green, with numerous (about 40) very narrow purplish-red vertical bars, the green interspaces about twice as wide; a broad band of reddish-orange, in width from nape to third dorsal spine, extending downward and backward on side behind the pectoral and widening out below, enveloping whole under parts from gill-openings to origin of anal, this area somewhat paler below, purplish behind ventrals; head rich bright blue, a small rusty-orange spot on upper edge of opercle; lips paler, lower jaw greenish; dorsal green along base, then a narrow greenish-blue line, next a broad reddish-brown or purplish-red band widening posteriorly, the fin narrowly bordered by pale blue; a jet-black spot with blue border on second dorsal membrane, this sometimes extending to first and third membranes; caudal blue, the produced rays reddish, a little greenish-blue on outer edge; anal greenish at base, rest of fin purplish blue; pectoral pale blue, dusky at tip, deeper blue at base; axil blue and green.

A specimen (No. 02939) somewhat faded, had the head and body and fins deep violet; chin bluish; a black spot on front of dorsal and a violet-black area on pectoral; area behind head violet-gray, scarcely contrasting with body; caudal violet.

Another specimen had the head violet, blue on lower jaw; area behind head orange-brown; body behind light green with a vertical orange-brown line on each scale; first dorsal spines violet with a black spot; pectoral pale with black area and black axil; dorsal behind first spines orange-brown with violet edge; caudal violet-gray, with the lobes bright orange-brown; anal violet-black.

Still another specimen (No. 03525) differed from typical examples in the entire absence of a paler bar on body at pectoral region.

Color in alcohol, head dark bluish or bluish-black; a broad, pale, bluish-white band around body under nape and first part of spinous dorsal; rest of body dusky brown washed with bluish-green; dorsal and anal greenish-blue; caudal dark with some bluish, in some cases with the distal portion, except produced rays, almost white; pectoral pale on base, the outer half dark; belly pale; chin rich blue.

The young have a black stripe, about as wide as the eye, extending from the snout to the upper half of the base of caudal, where its end is slightly broadened and rounded. Below and parallel with the dark stripe is a pinkish-white one of about equal width. Some specimens have a narrow, short, indistinct, dusky stripe below the latter. With increasing age the stripes become indistinct and disappear, the general color grows darker, while the broad, light band behind the head appears. The caudal is at first rounded, later becoming concave, the upper and lower rays being much produced in the adult.

This species is the most abundant of the labroids inhabiting Hawaiian waters. Numerous specimens were obtained by Dr. Jenkins, and a yet greater number is in the present collection obtained by us at Honolulu, Hilo, and Kailua; and by the *Albatross* at Honolulu, Laysan Island, station 3881 between Maui and Molokai, and at Puako Bay, Hawaii. The fish is not known to occur in Samoa.

Julis duperrey Quoy & Gaimard, Voyage de l'Uranie, Zool., 268, pl. 56, fig. 2, 1824, Sandwich Islands.

Julis clepsydralis Smith & Swain, Proc. U. S. Nat. Mus., V, 1882, 136, Johnston Island.

Thalassoma pyrrovinctum Jenkins, Bull. U. S. Fish Comm., XIX, 1899 (Aug. 30, 1900), 51, fig. 7, Honolulu. (Type, No. 6138 L. S. Jr. Univ. Mus.; Coll. O. P. Jenkins.)

Julis duperrei, Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 506 (Honolulu and Laysan).

Thalassoma duperrey, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 463 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 629 (Hawaiian Islands; Laysan Island).

238. *Thalassoma lunaris* (Linnæus).

Head 3.5 in length; depth 3.7; eye 5 in head; snout 3.2; preorbital 4.8; interorbital 4; D. VIII, 13; A. II, 12; scales 4-27-8.

Body greatly compressed, elongate; caudal peduncle deep; dorsal outline evenly curved; vertical outline slightly less convex; head small, much longer than deep; snout rather long, conic; jaws each with a pair of stout canines in front and a series of shorter canine-like teeth laterally, growing successively shorter posteriorly; no posterior canine; preorbital moderately deep, oblique; opercle and preopercle smooth, the former ending in a broad low flap; scales large, thin, and leathery on edges, the surface finely striate, the spaces between the striae with cross-markings, giving the appearance of being covered with minute scales; scales on breast and nape somewhat reduced; a patch of 8 rather large scales on upper end of opercle, rest of head entirely naked; lateral line following curvature of back for 19 or 20 scales, then bending downward 2 rows and continuing to base of caudal; pores with 3 to 6 or 7 branches; a low sheath of scales at base of dorsal and anal; small scales on base of caudal; fins moderate, origin of dorsal slightly posterior to base of pectoral; dorsal spines rather short, the longest about equal to distance from tip of snout to middle of pupil, dorsal rays slightly longer; anal similar to soft dorsal; caudal lunate, the outer rays produced, their length nearly twice that of middle rays; ventrals short, reaching half way to origin of anal; pectoral rather long; equal to distance from base of ventrals to vent, or 1.4 in head.

Color in life, greenish, the body crossed by numerous narrow, vertical broken orange bands; side of head and snout with 4 broad bright-green bands, separated by golden interspaces; the first green band extending from eye to upper end of gill-opening; the second from eye across cheek and opercle to base of pectoral; the third from median line of mandible upward and backward across cheek to edge of opercle; the fourth branching from this at its anterior end and extending backward to lower edge of gill-opening; a pair of less distinct greenish lines on median line of throat; an orange band across side of snout from mouth to eye, continued under eye with the third orange band; dorsal fin with a yellow band distally, bounded below by a narrow blue line, beneath which is a broader orange band; anal orange at base, bounded by a narrow blue line, beyond which the fin is greenish-yellow; caudal yellow, the produced rays orange; pectoral dark blue, almost black distally, the base orange, 2 narrow blue stripes on breast below pectoral, separated by an orange interspace.

In alcohol these colors mostly disappear, the green stripes on the head becoming pale blue and the orange interspaces purplish brown; dorsal pale distally, a faint median dark line beneath which the color is pale yellowish; anal similar, the basal portion more greenish; pectoral with an oblong black bar from middle of middle rays to tip of longest rays, rest of fin yellowish or dusky-white.

We identify with this species a single specimen (No. 03429) 6 inches long, obtained at Honolulu July 20. It agrees well with Bleeker's description and plate of *Julis lunaris* (90, pl. 33, fig. 5). Jordan and Snyder had a specimen from Japan which they identified with *Labrus lutescens* Solander, and they expressed the opinion that that species might be the same as *Labrus lunaris* Linnæus. The original

description of *J. lunaris* is not sufficiently full to enable us to settle this question with certainty. Jordan and Snyder expressly state that the head of their specimen was naked; ours has a patch of well-developed scales upon the upper limb of the opercle, which may indicate specific distinction. Moreover, we are able to find but 2 anal spines, a character in which it differs from other species of *Thalassoma*.

Labrus lunaris Linnæus, Syst. Nat., Ed. X, 283, 1758, India.

Labrus zeylonicus (Forster) Pennant, Indian Zoology, 56, pl. 16, 1790, Ceylon.

Labrus viridis Bloch, Ichth., VIII, 104, pl. 282, 1797, Japan.

Julis lunaris, Cuvier & Valenciennes, Hist. Nat. Poiss., XIII, 409, 1839 (Massuah; Siam; Ceylon; Otaïti; Java); Günther, Cat., IV, 180, 1862; Day, Fishes India, 403, pl. 86, fig. 1, 1877.

Julis meniscus Cuvier & Valenciennes, op. cit., 415, Seychelles, Macao.

Julis viridis, Cuvier & Valenciennes, op. cit., 420 (Bourbon Island).

Julis mertensi Cuvier & Valenciennes, op. cit., 421, 1737, Ulea.

Labrus lutescens Solander Ms., Tahiti.

Julis lutescens, Bennett, Zool. Beechey's Voy. Blossom, Fishes, 65, pl. XIX, fig. 2, 1839 (Tahiti, Riukiu; after Solander); Brevoort, Exped. Japan, Fishes, 271, pl. VIII, figs. 3 and 4, 1856 (Nafa, Okinawa Island).

Thalassoma lutescens, Jordan & Snyder, Proc. U. S. Nat. Mus., XXIV, 1902, 647 (Riukiu Islands).

239. *Thalassoma aneitense* (Günther). Plate 41.

Head 3.7 in length to base of caudal; depth 3.4; snout 2.8 in head; eye 5.3; interorbital space 4; scales 26-11; D. VIII, 13; A. II, 11.

Teeth in both jaws growing gradually shorter from before backward; no enlarged teeth or canines; head smooth; scales smaller on breast and belly than on sides and back; lateral line extending along fourth row of scales to below base of eleventh articulated ray, where it bends downward across 3 rows of scales and passes along middle of caudal peduncle; first dorsal spine equal in length to about two-thirds diameter of orbit, the others successively longer, the last being 1.6 times diameter of orbit; articulated rays higher, about twice diameter of orbit; anal spines rather strong, the first equal in height to third dorsal spine, the second equal to last dorsal spine; dorsal and anal rays about equal in height; pectoral 1.4 in head; caudal probably truncate; ventral 2 in head.

Color in spirits, pale brownish, the head dusky above; 2 dusky bars passing backward from eye, the lower of which extends toward angle of opercle; a broad semicircular bar extending from chin toward eye and bending downward toward lower edge of opercle; a smaller semicircular bar below the latter; scales with small white spots; distal half of pectoral blackish, the color fading out toward the lower edge; dorsal with a dark spot about the size of pupil on membrane of second and third spines. Known to us from the Hawaiian Islands by only one specimen, 5.2 inches long, obtained at Honolulu by Mr. Berndt.

Julis aneitensis Günther, Cat., IV, 183, 1862, Aneityum. (Coll. Macgillivray.)

Thalassoma aneitense, Jordan & Snyder, Proc. U. S. Nat. Mus., XXVII, 1904, 943 (Honolulu).

Thalassoma aneitensis, Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 510 (Sandwich Islands).

Genus 157. JULIS Cuvier.

This genus as here understood differs from *Coris* chiefly in the more elongate body and especially in the smaller scales, which are 75 to 95 in lateral series. In most species the anterior dorsal spines are slender and prolonged. Brilliantly colored fishes of the coral reefs, some of the species burying themselves in the sand. The name *Julis*, originally based on the Girelle of the Mediterranean (*Julis julis*), has been wrongly transferred to the genus *Thalassoma* by Bleeker and by Günther.

Julis Cuvier, Règne Animal, 1st ed., I, 261, 1817 (*julis*).

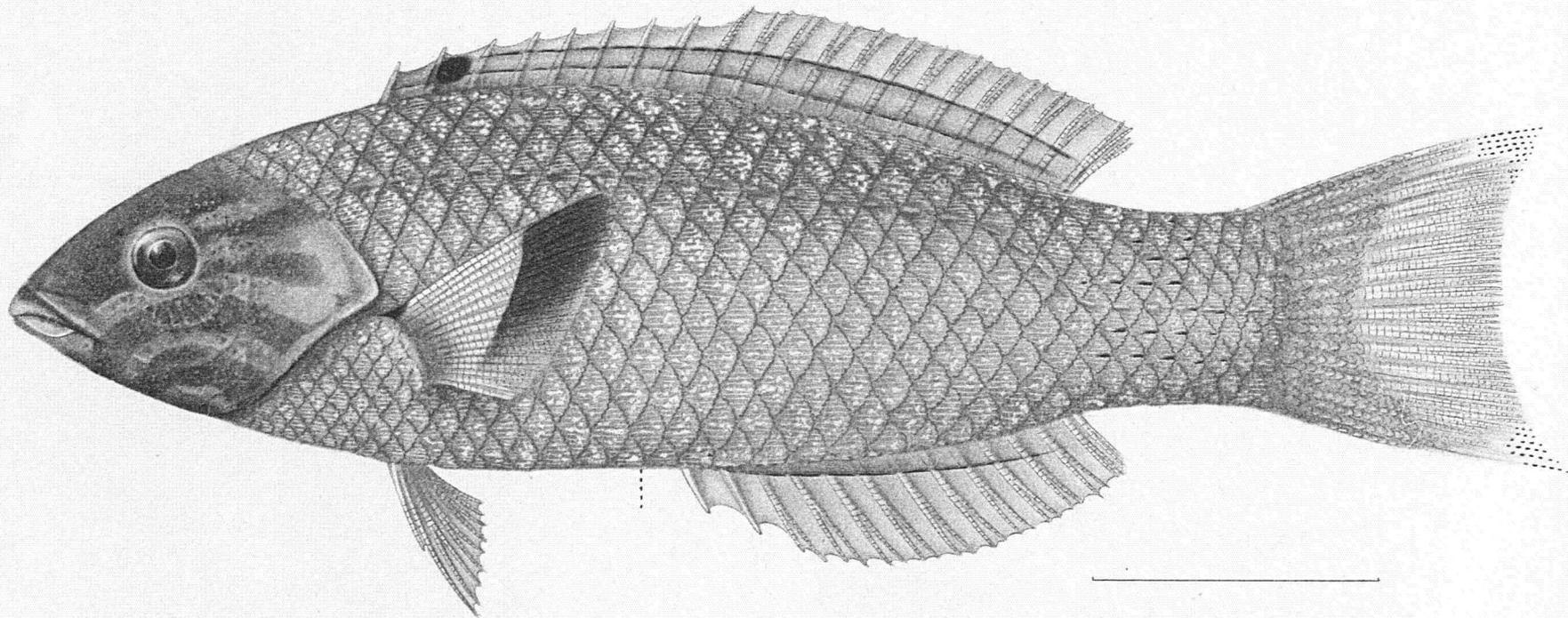
a. First 2 dorsal spines longer than the others, the first 1.4 to 1.8 in head.

b. Scales in lengthwise series, fewer than 90 (76 to 82); posterior part of body with violet spots; no blackish vertical bars on side behind pectoral.

c. Eye 8 in head; scales in lengthwise series 76; body color in life dark reddish brown; a deep green cross band from dorsal to vent; middle line of throat whitish; posterior violet spots blue-edged *gaimard*, p. 305

cc. Eye 7 in head; scales in lengthwise series 82; body color in life brownish orange or cinnamon-brown, no deep green cross band from dorsal to vent; middle line of throat whitish; posterior violet spots larger than in *gaimard* and edged with dark violet *puleherrina*, p. 305

bb. Scales in lengthwise series 90 or more (92); posterior part of body without violet spots; about 8 blackish vertical crossbars on side behind pectoral *lepomis*, p. 306



THALASSOMA ANEITENSE (GÜNTHER).

- aa. First 2 dorsal spines shorter than the others, the first one 5 to 5.5 in head, about equal to eye.
 d. Eye large, about 5 to 5.5 in head.
 c. Body with longitudinal color bands; no black-bordered white areas on nose, nape, side of back, or caudal peduncle *flavorittata*, p. 308
 ee. Body without longitudinal bands; black-bordered white areas on nose, nape, side of back, and base of dorsal, and on top of caudal peduncle *greconovi*, p. 308
 dd. Eye small, about 8 in head; longitudinal color-bands present *cydonxii*, p. 309

240. *Julis gaimard* Quoy & Gaimard. "Lolo."

Head 3.3 in length; depth 3.4; eye 8 in head; snout 2.75; mouth 4; interorbital 4; D. IX, 12; A. III, 12; scales 6-76-27.

Body oblong, elongate, deepest about origin of anal; head longer than deep, pointed; snout long, profile above straight, pointed; mouth horizontal; jaws equal, produced, pointed; lips thick, fleshy; teeth large, conic; upper jaw with 2 canines in front, mandible with 2 large canines fitting in between, all projecting forward; eye small, anterior high, margin of preopercle nearly forming a right angle; interorbital space convex, elevated; nostrils small, close, anterior in short fleshy tube; first 2 dorsal spines longest, anterior 1.5 in head; longest dorsal ray 2.2; caudal rounded; pectoral 1.4 in head; ventrals long, pointed, 3.7 in body; scales small, thin, cycloid, extending well out on basal portion of caudal; lateral line high along back, falling below last dorsal rays to middle of side of caudal peduncle, then straight.

Color in life (No. 252, O. P. Jenkins) bright red, bands on head and chin green; a greenish vertical band behind tip of pectoral; axil of pectoral dark blue with green and yellow border. Another specimen was (No. 03477) reddish brown, rather dark; a deep green cross band from dorsal to vent; stripes on head clear green, the lowest from lower jaw to base of ventral interrupted in certain places; middle line of chin and throat whitish; snout flesh-colored; axil of pectoral black, broadly edged with green; posterior half of body with small blue-edged violet spots which grow larger and more crowded behind, but are still smaller than in *pulcherrima*; dorsal scarlet, crimson at base with fine dots of violet here and there, violet stripes above the last at edge, the middle one broadening and becoming green anteriorly; caudal golden, orange below; anal dark crimson with a blue and violet line; small violet dots below, and larger ones on orange distal part of fin; pectoral crimson, its tip orange; ventrals dull orange, edged in front with dark violet, the third (long) ray green.

Color in alcohol, dull purplish brown; head pale greenish brown, snout pale or dull brown; several lines and spots down middle of forehead; a brown line from side of snout to eye, continued, broken above, to origin of dorsal; brown streak behind eye to corner of opercular flap; a dull blue-green streak from upper lip toward eye, then down across opercle below; a deep blue band from mandible along side of breast to base of ventral; chin to space between ventrals deep blue; round dark-edged blue spots, small, very numerous on trunk, especially posteriorly; dorsal and anal bordered with gray brown, with 3 narrow dark marginal lines parallel with edges of fins; small spots on dark bases of each dorsal and anal; a blue-green spot at base of each dorsal spine and most soft rays; caudal and pectoral whitish or pale brown; ventrals broadly dusky on outer portion; axil of pectoral deep blue black, edged with blue and blue green.

Described from an example (No. 625) taken at Honolulu by the Fur Seal Commission in 1896.

This species is common about the reefs of Honolulu, burying itself in the sand when at rest, with only the snout and eyes visible. For this reason it is called *lolo*, lazy.

Three examples were obtained by Dr. Jenkins, 1 by the *Albatross* in 1896, and 3 by us, 1 of them from Hilo.

Julis gaimardi Quoy & Gaimard, Voyage de l'Uranie, Zool., 265, pl. 54, fig. 1, 1824, Sandwich Islands; Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 460 (Honolulu).

Coris gaimardi, Günther, Ann. & Mag. Nat. Hist., VIII, 1861, 387; Günther, Cat., IV, 200, 1862 (Sandwich Islands); Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 510 (Sandwich Islands).

241. *Julis pulcherrima*. (Günther). "*Himalca loló*." Plate XXVII.

Head 3.35 in length; depth 3.4; eye 7 in head; snout 3; mouth 4.4; interorbital 3.8; D. IX, 12; A. III, 12; scales 6-82-25.

Body elongate, deepest about origin of anal; head longer than deep, pointed; snout long, pointed; mouth horizontal, jaws produced, equal; lips thick, fleshy; teeth conic, directed forward; 2 large

canines in front of upper jaw directed forward; 2 large canines in front of mandible, directed forward, fitting in between upper pair; eye small, anterior, high in head; margin of preopercle a thin fleshy flap; interorbital width convex, elevated; nostrils close together in front of eye, anterior in short fleshy tube; first 2 dorsal spines elongate, first longest, 1.4 in head; longest dorsal ray 2; caudal rounded, 4.25 in body; pectoral 1.4 in head; ventrals long, pointed, 3.75 in body; scales small, thin, cycloid, extending well out over basal portion of caudal; lateral line high along back, falling below last dorsal rays to middle of side of caudal peduncle, then straight.

Color in life (No. 03475) brownish orange, the posterior half shaded blackish violet, the anterior half shaded on salmon; snout bright salmon, median line deep violet; line before eye and above, extending in dots to front of dorsal bright violet, the lines bordered with crimson, especially before eye; a broader crimson band behind eye edged with paler; a curved band below, similar; throat and middle of breast violet black; axil of pectoral jet black with a crescent of bright green above; sides of body with violet blue spots, each ringed with darker violet and about alike in size, these sparse on anterior half, crowded behind; dorsal bright salmon-orange with violet-crimson edged spots, violet lines and dashes, and steel-blue edges; caudal clear golden; anal salmon-orange, very bright blue spots at base; edge blue with black line, the middle stripe muddy blue; pectorals bright orange; ventrals orange, edged with violet blue.

Color in life of another example (No. 03380), cinnamon-brown, rather darker posteriorly, bright on head; middle line of throat and breast livid blue-brown, with a broad green-brown band on each side; a curved brown band edged with red from angle of mouth to edge of subopercle, another from eye to opercular flap; a dark blue-black streak from eye backward toward front of dorsal where it breaks up into spots; a dark median stripe on front of head; side of body with round violet spots edged with blue, much more numerous and brighter posteriorly; tail golden yellow, unspotted; dorsal orange-red; violet spots at base, then a violet line, then a shade of lighter orange with a blue-black margin; a dusky blotch at base of first dorsal spine; anal colored like dorsal with a row of curved violet streaks instead of the stripe; violet spots at base very distinct; pectoral red, fading to yellowish; axil of pectoral black with green edge; ventrals yellowish green, the long rays orange, spines violet.

Color in alcohol, dull purplish brown; head pale brown, snout very pale or whitish; several lines and spots in single series down middle of forehead; a brown line from side of snout to eye, continued, broken above, to origin of dorsal; a brown streak behind eye to corner of opercular flap; a pale brown streak from upper lip toward eye then down across opercle below; a brown band from mandible along side of breast to base of ventral; chin to space between ventrals with blackish streak; round, dark-edged blue spots on trunk, most numerous posteriorly and on tail; dorsal and anal whitish, margins narrowly blackish with many dark-edged bluish spots, and dusky tinge basally; outer portions of soft dorsal and anal each with a narrow dusky line parallel with margins of fins; caudal and pectoral whitish, latter blackish inside at base; ventrals whitish with dusky edges.

Described from an example (No. 05345) from Honolulu. This species is abundant, found with the preceding about the reefs at Honolulu and elsewhere among the Hawaiian Islands, specimens having been obtained by about every collector who has visited those islands. The localities represented in our very large series of specimens (45) are Honolulu, Hilo, and Kailua. These examples range in length from 5.4 to 11.25 inches. Occasional in Samoa.

Julis formosus, Bleeker, Nat. Tijds. Ned. Ind., V, 1853, 169 (Macassar); not of Bennett.

Coris formosus, Bleeker, Atlas Ichthy., I, 99, pl. 19, fig. 3, 1862

Coris pulcherrima Günther, Cat., IV, 200, 1862, Amboyna, Tahiti, Aneityum; Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 507 (Honolulu).

Julis pulcherrima, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 460 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 528 (Honolulu).

242. *Julis leptomis* (Jenkins). "Hilu lawwili," "Uhu." Fig. 131.

Head 3.35 in length; depth 3.35; eye 8 in head; snout 2.9; mouth 4.5; interorbital 4; D. ix, 12; A. iii, 12; scales 8-92-35.

Body ovoid, elongate, deepest about pectoral; head elongate, much longer than deep, the upper profile convex, swollen in front of eye above; snout long, blunt, convex; mouth horizontal, small; lips thick, fleshy, broad; teeth large, powerful, conic; 2 large canines in front of each jaw, the lower fitting in between those above; eye small, well anterior, high in head; nostrils small, anterior in very

short tube; opercle with well-developed flap posteriorly; interorbital space high, convex; first 2 dorsal spines elongate, flexible, the first longer, 1.8 in head; third anal spine longest, 4; longest anal ray 2.3; caudal slightly rounded posteriorly; pectoral rather short, 1.5; ventral 1.7; scales small, thin, those on occiput very small, head otherwise naked; lateral line rather indistinct, running down on side of caudal peduncle below posterior dorsal rays.

Color in life, green with blue shades; opercular spot deep blue, blackish before and behind; about 8 blackish vertical bars behind pectoral; back very green, middle and along lateral line tinged with olive brown; head olive gray with spots and radiating lines of clear blue; throat and breast blue with drab olive spots; fins greenish sky-blue marked with olive; pectoral olive tinged with bluish; ventrals similar, more blue.

Another nearly fresh example (No. 03344) with general color bright blue; side back of pectoral with 7 or 8 darker short cross-bars; head pale blue with numerous bluish-white spots about size of pupil; opercular flap bright blue with pale margins, yellow posteriorly, brown in front; dorsal vermiculated or blotched with olive, greenish, and bright blue; caudal dirty blue; anal with irregular spots and blotches of bright blue separated by greenish-yellow; pectoral bluish-olive; ventrals pale olive; iris

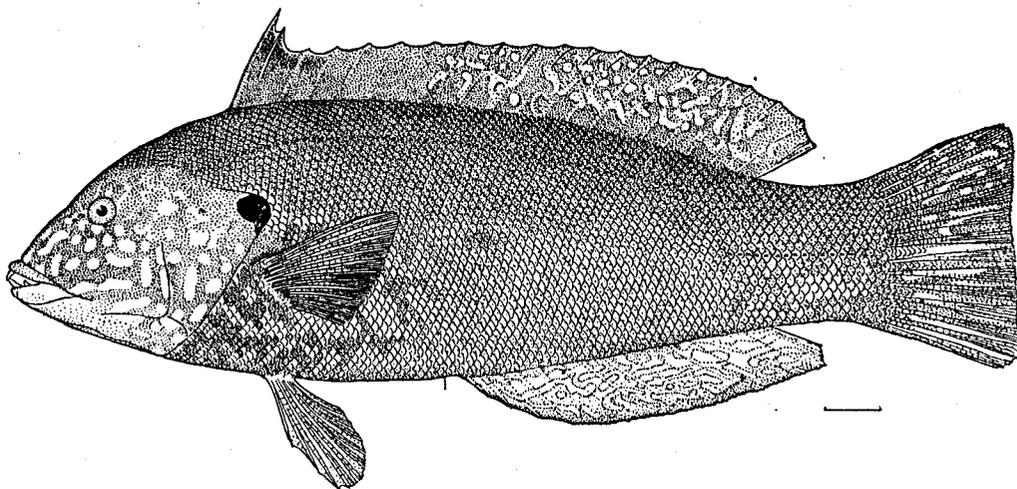


FIG. 131.—*Julis lepomis* (Jenkins). Type of *Coris lepomis* Jenkins. Figure not quite accurate in proportional measurements.

yellowish. One example when fresh had the black opercular spot shaded with deep bluish, palest in center; golden markings on head bright yellowish-brown.

Color in alcohol, dull purple brown; head and chest marked with broad pale short lines, spots, and blotches; opercular flap blue-black behind; short blackish oblique lines on side beyond tip of pectoral; vertical fins grayish, marked with pale bluish blotches and spots, most numerous on rayed portions of fins; a large blackish blotch behind second and third dorsal spines; pectoral and ventral grayish, the former variegated with indistinct lighter markings.

Described from an example (No. 04099) from Honolulu.

This is the largest and one of the handsomest of the many shore fishes of this group. It is often seen in the markets of Honolulu. We have 11 examples from Honolulu and 1 from Hilo, ranging in length from 13.75 to 18.75 inches.

Coris lepomis Jenkins, Bull. U. S. Fish Comm., XIX, 1899 (Aug. 30, 1900), 48, fig. 4, Honolulu. (Type, No. 12141, L. S. Jr. Univ. Mus.)

Julis lepomis Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 461 (Honolulu).

243. *Julis flavovittata* Bennett. Plate XXVIII.

Head, measured to end of opercular flap, 3.12 in length; depth 4; snout 3.3 in head; eye 5.5; D. ix, 12; A. iii, 12; scales 7-88-27.

Color in alcohol, white with black longitudinal stripes. A black stripe, pointed anteriorly, broken and irregular posteriorly, extends from middle of snout to end of dorsal; a second runs from tip of snout through eye to base of caudal, where it is connected with the one on opposite side by a band passing over the caudal peduncle; a third extends from lower jaw over base of pectoral to base of caudal; a fourth passes from throat to end of anal; breast and belly dusky; dorsal black, edged with white, a few white blotches along middle of fin; caudal white at base and on margin, middle of fin with a black lunate band; anal black, bordered with white; pectorals white; ventrals dusky at base; a posterior canine tooth present.

This species, described originally from the Hawaiian Islands, was not obtained by us, but 1 specimen, 1.8 inches long, was taken by the *Albatross* at Laysan Island.

Julis flavovittatus Bennett, Zool. Journ. Lond., IV, 36, 1829, Sandwich Islands.

Coris flavovittata, Günther, Cat., IV, 205, 1862 (Bennett's type); Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 511 (Sandwich Islands).

Julis flavovittata, Snyder, Bull. U. S. Fish. Comm., XXII, 1902 (Jan. 19, 1904), 528 (Laysan Island).

244. *Julis greenovii* Bennett. Plate XXX.

Head 3.4 in length; depth 3.7; eye 5 in head; snout 3.5; D. ix, 12; A. ii, 12; P. 12; V. i, 5; C. 14; scales 6-78-21.

Body short, compressed, and fusiform; dorsal outline regularly and evenly arched from tip of snout to origin of dorsal fin, thence very slightly convex to base of caudal; ventral outline about evenly convex throughout; caudal peduncle compressed, the least depth less than snout and eye; head small, thin, and pointed; snout pointed; mouth small, nearly horizontal, the jaws equal; maxillary short, not reaching orbit, its distal end wholly concealed under the broad, thin preorbital; upper jaw with a pair of slender, projecting canines in front, and a series of short, close-set teeth on side, the anterior one somewhat enlarged and canine-like; no canine at angle of mouth; teeth of lower jaw similar to those of upper; eye small, wholly in anterior half of head; interorbital space moderately wide, convex; gill-membranes united to the isthmus; opercle ending in a long thin flap. Origin of dorsal fin in vertical at base of pectoral; dorsal fin low, the rays and spines of approximately equal length, the last spine about 3.2 in head, the last ray about 3; caudal rounded, the middle rays about 1.7 in head; anal similar to dorsal, its origin under base of first dorsal ray; pectoral about 1.7 in head; ventral pointed, its length 1.6 in head. Scales very small and smooth; head entirely naked; lateral line strongly arched above the pectoral, then closely following outline of back until under tenth dorsal ray, where it bends downward to median line of side and continues thence to base of caudal.

Color in life, rich blood-red, faintly tinged on lower parts of head, at base of pectoral, and slightly on middle of side with yellowish or orange; top of snout with an ovate or oblong white area surrounded by a narrow black border; a similar white saddle across nape at posterior border of eyes; a diamond-shaped white spot on side and base of dorsal, extending upon lower part of fourth to sixth membranes of spinous dorsal; another roundish white spot on side, extending from just below lateral line upward upon seventh and eighth interradial dorsal membranes, about one-half the spot being upon the fin; a white saddle on middle of caudal peduncle; these 5 white spots each with a distinct black border, the one on caudal peduncle not well defined; caudal peduncle with a large diffuse brownish-black area, breaking up into small specks at the edges, especially anteriorly, and overlaid with small sky-blue spots, largest and most distinct in the center and posteriorly; dorsal fin rich red, the spines with slight yellow tinge, the rays bluish-white, a narrow black border full length of fin, slightly broader posteriorly; a large oblong bluish-black spot on last 2 dorsal membranes, the 2 white spots on side involving lower portions of membranes between fourth and seventh spines and between seventh and ninth rays; caudal fin brownish-yellow, lightest toward tip, reddish at base, and crossed near the middle by 2 series of oblong black spots on the membranes, those of the inner series the larger, the 2 series parallel and curving distally; anal similar to dorsal, with a narrow black border, but without spots anywhere; pectoral lemon-yellow, washed with reddish on basal portion; ventral yellowish, washed with reddish on proximal portion, the outer two-fifths sky-blue, darkest at tip.

In alcohol the bright colors all fade; general color grayish-yellow, darkest on nape; jaws and lower parts of head pale; breast and isthmus dark; the 4 white saddles on back and spot on nose plain white, each with black border; side of caudal peduncle rusty black, the blue faded; dorsal and anal fins white, each with a narrow black border, the former with an oblong black spot on last 2 membranes; caudal white, rusty at base, crossed near the middle by 2 parallel series of black spots, those of inner series largest and practically continuous; pectoral and ventrals pale.

The above description is from a specimen (No. 2743) 3.5 inches long, taken in 1902 by Dr. Jordan at Apia, Samoa. The colored painting by Kako Morita is from color notes and sketch from the live fish by Dr. Jordan. The original type specimen came from Hawaii, but none has since been reported from those islands.

Julis greenovii Bennett, Zool. Journ. London, IV, 1829, 37, Sandwich Islands.

Julis leucorhynchus Bleeker, Act. Soc. Sci. Ind. Neerl., I, 1856, 57, Manado.

Coris greenoughii, Günther, Ann. & Mag. Nat. Hist., VIII, 1861, 387 (no locality); Günther, Cat., IV, 204, 1862 (Sandwich Islands).

245. *Julis eydouxi* Cuvier & Valenciennes. "Hilu." Plate XXIX.

Head 3.1 in length; depth 3.2; eye 8.2 in head; snout 2.8; mouth 3.6; interorbital 4.7; D. ix, 11; A. iii, 12; scales 8-81-31.

Body elongate, compressed, greatest depth at beginning of anal; head elongate, pointed, its depth 1.4 in its length; upper profile of head slightly convex; snout compressed, 2.8 in head; mouth rather long, horizontal, the corner slipping under preorbital sheath; lips thick, fleshy; teeth powerful, conic; 2 produced strong canines in front of each jaw, those on mandible largest and fitting in between upper pair; jaws pointed and produced; eye small, anterior, high in head; preopercle with thin convex edge; interorbital width convexly elevated; nostrils close together in front of eye, anterior in short, fleshy tube; last dorsal spine 3.3 in head; longest dorsal ray 2.5; anal spines graduated to last, which is longest; anal rays longer than spines, longest 2.4 in head; caudal broad, margin a little convex, 1.4 in head; pectoral with upper rays longest, 1.6; ventral pointed, not reaching anus, 2; scales small, cycloid, rather thin; head, except on occiput, naked; small scales only on base of caudal, none on vertical fins; lateral line high, concurrent with back till below last dorsal rays, then running down and along middle of side of caudal peduncle.

Color in life (No. 02964), upper half of side with a broad lake-purple stripe, divided for its anterior two-thirds into 2 by a narrow pale lemon stripe, which begins on snout and extends across head just above eye to beneath fifteenth dorsal ray; a narrow stripe of lake-purple at base of dorsal separated from the broad stripe by a somewhat wider pale lemon stripe, which begins on nape just above posterior rim of eye and unites with the yellow of caudal peduncle, the broad lake purple stripe narrowly bordered below by rose-pink, below which is a narrow yellowish-white line, narrowest and best defined on cheek, broadest and most yellow on posterior third of body; lower half of side rose-pink, whitening below and somewhat yellowish on caudal peduncle; a broad brick-red stripe from snout through eye to upper edge of opercle; opercular flap light greenish anteriorly, then black, then pale on posterior border; cheek and lower half of head reddish, mixed with lemon; dorsal black and brownish-red, with narrow white border, and a series of large roundish chrome-yellow spots; a black ocellus on second dorsal ray and its membrane; base of caudal yellowish-white, followed by a broad purplish-black lunate bar, anteriorly with a yellowish streak and posteriorly by white, which is broadest at the outer angles; anal lake-red with yellow spots at bases of spines; the last ray yellow, fin becoming blacker toward edge and bordered narrowly with white; pectoral pale, slightly yellowish at base; ventrals white, anteriorly edged with vermilion.

In another example (No. 05325) there is an indistinct brown band along middle of side from pectoral to base of lower caudal rays.

Color in alcohol, pale brownish white; back with 3 blackish brown longitudinal bands, first beginning on side of snout, narrow, running along base of dorsal, and continued as broad crescent across caudal; above and behind eye it gives out a second band which joins the lowest near descent of lateral line; lowest or third band broadest, beginning on side of snout, running through eye across opercle above to base of upper caudal rays; black spot on opercular flap; dorsal and anal blackish brown with narrow white edges, the former with median series of whitish spots; anal blackish brown with median longitudinal dark band; pectorals and ventrals pale like belly.

This large and brilliant species, described originally from these islands, is very common in the markets of Honolulu and Hilo, from which places we have numerous specimens 5.8 to 15.75 inches long.

Julis cybtourii Cuvier & Valenciennes, Hist. Nat. Poiss., XIII, 455, 1839, Sandwich Islands; Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 461 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 528 (Honolulu).

Genus 158. CORIS Lacépède.

Body compressed, oblong, covered with moderate or small scales, 50 to 60 in the lateral line; head scaleless; lateral line not interrupted; posterior canine tooth absent or not; dorsal ix, 12; anal iii, 12; anterior dorsal spines usually produced and flexible; caudal rounded.

Polynesia, the species few; deeply colored fishes of the coral reefs.

The genus *Coris*, as understood by Günther, differs from *Halichares* in its small scales. It comprises a great variety of forms, and is divisible into 6 well-marked genera or subgenera, as follows:

- a. Scales in lateral line 50 to 85.
- b. Posterior canine obsolete; head naked; caudal rounded; scales 60.....*Coris*, p. 310
- bb. Posterior canine present.
- c. Head with a patch of scales behind the eye; caudal rounded; scales 50.....*Ophthalmolepis*, p. 310
- cc. Head entirely naked.
- d. Caudal rounded or truncate.
- e. Scales 55 to 65.....*Hemicoris*, p. 310
- ce. Scales 70 to 85.....*Julis*, p. 304
- dd. Caudal forked, the lobes much produced in the adult; scales 73.....*Pseudocoris*, p. 310
- aa. Scales in lateral line about 120; body oblong; head naked; no posterior canine.....*Hologymnosus*, p. 310

Of these groups we here recognize *Coris*, *Julis*, *Ophthalmolepis* (*lineolata*), and *Hologymnosus* (*fasciatus*) as distinct genera. It is not unlikely that *Pseudocoris* (*heteroptera*) is entitled to similar rank.

Coris Lacépède, Hist. Nat. Poiss., III, 1801, 96 (*aygula*).

Hemicoris Bleeker, Consp. Gen. Labr. in Versl. Kon. Akad. Wet., XIII, 1862, 99 (*Halichares variegatus*); Bleeker, Proc. Zool. Soc. London 1861, 410-413; Bleeker, Atlas Ichthy., I, 105, 1862.

- a. Scale 50 to 55. Colors bright.
- b. First 2 anterior spines removed from and longer than the others; body deepest about over middle of pectoral.
- c. First dorsal spine considerably produced, its length much less than 2 in head; eye small, 6.4 in head.....*ballieui*, p. 310
- cc. First dorsal spine not much produced, considerably over 2 in head; eye larger, 5.4 in head.....*rosea*, p. 311
- bb. First 2 anterior spines not removed from or longer than the others, rather shorter; body deepest about over origin of anal.....*venusta*, p. 312
- aa. Scales 60. Color chiefly blackish.....*aygula*, p. 313

246. *Coris ballieui* Vaillant & Sauvage. Plate XXXII.

Head 3.5 in length; depth 3.4; eye 6.4 in head; snout 2.8; mouth 5; interorbital 5.2; D. ix, 12; A. iii, 12; scales 5-53-18.

Body elongate, oblong, deepest about middle of pectoral; head longer than deep, pointed; snout long, pointed; mouth horizontal, upper jaw slightly produced; lips thick, fleshy; teeth strong, conic, directed forward; 2 large canines in front of each jaw directed forward, those on mandible fitting in between upper pair; eye rather large, posterior rim about middle of length of head; preopercular flap thin; interorbital width elevated, convex; nostrils close together in front of eye, anterior in short tube; first dorsal spine elongate, filamentous, 3.7 in body; longest dorsal ray 2.2 in head; third anal spine longest, 4.3; longest anal ray 2.25; caudal rounded, 1.6; ventrals long, pointed, 1.7; scales rather large, thin, cycloid; lateral line high along back, descending below last dorsal rays to middle of sides of caudal peduncle.

Color in life (No. 03260) light olive-brown, with a silver streak on each row of scales, about 22 in number, some scales with a light bluish-green central spot forming irregular stripes, the one above lateral line most distinct, the interspaces forming golden stripes; behind tip of pectoral about 5 short vertical irregular bars of golden, alternating with violet, behind these faint violet stripes alternating with 3 golden ones; base of anal violet; breast and belly white; head golden olive, with blue dashes and stripes, 2 across lower jaw meeting to surround a white area, 2 behind these across pre- and subopercle; first dorsal spine dusky, a jet black blue-edged spot behind it; dorsals with 1 broad and 3 wavy narrow stripes of sky blue, with golden interspaces; caudal golden yellow, with 5 sky-blue wavy

crossbars; anal like dorsal, the bands interiorly parallel with the margin, posteriorly running upward and backward; pectoral pale yellowish, the base dusky; ventrals reddish, the outer ray dusky; iris orange pink.

Color in alcohol, dull brown, side with narrow longitudinal dull purplish brown lines, broadest on back; head brown with leaden streak from corner of mouth to eye, another from corner of mouth back over preopercle; and still others below eye, on opercle, and mandible; vertical fins pale grayish, dorsal with blackish spot at bases between first 2 spines; spinous dorsal gray with 3 narrow pale or light gray lines on outer portion, below which are gray blotches and longitudinal streaks of gray; anal gray with oblique whitish crossbars; caudal gray with darker blackish edged vertical cross bands; pectoral and ventrals pale, the latter with dusky edges.

Described from an example (No. 05326) from Honolulu.

Rather common. Dr. Wood's Honolulu collection contained 1 specimen, and we obtained 13 at Honolulu and 3 at Hilo. The *Albatross* also secured specimens at Honolulu. The numerous specimens examined range in length from 6.5 to 11.5 inches.

Coris ballieui Vaillant & Sauvage, Rev. Mag. Zool., III, 1875, 285, Sandwich Islands; not *Julis ballieui* Vaillant & Sauvage. *Coris schauinslandii* Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 508, taf. V, fig. 1, Honolulu. *Hemicoris baillieui*, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 461 (Honolulu). *Hemicoris ballieui*, Snyder, op. cit. (Jan. 19, 1904), 528 (Honolulu).

247. *Coris rosea* Vaillant & Sauvage. "Malamalama." Fig. 132.

Head 3.35 in length; depth 2.75; eye 5.4 in head; snout 2.8; mouth 4.7; interorbital 4.6; D. ix, 12; A. iii, 12; scales 5-53-18.

Body elongate, oblong, deepest about middle of pectoral; head longer than deep, pointed; snout long, pointed; mouth horizontal, jaws produced, equal; lips thick, fleshy; teeth conic, strong, directed

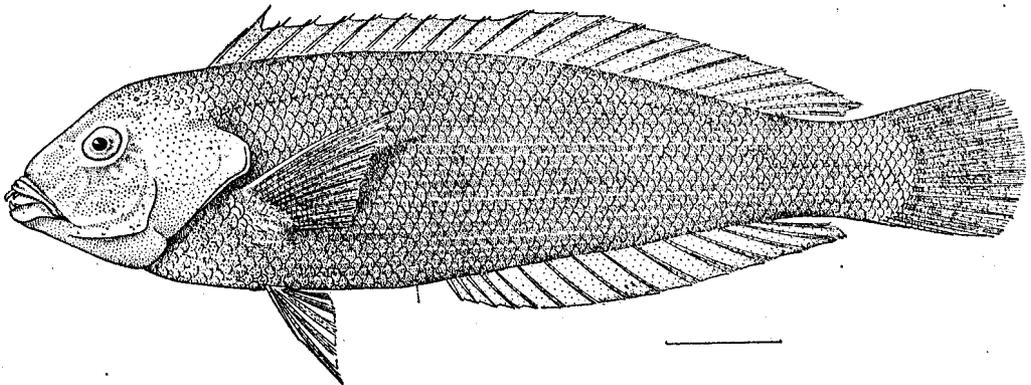


FIG. 132.—*Coris rosea* Vaillant & Sauvage. Type of *Hemicoris keleipionis*. Figure not quite accurate in proportional measurements.

forward; 2 large canines in front of upper jaw directed forward; 2 large canines in front of mandible directed forward, fitting in between upper pair; eye rather large, high, a little before middle of head; preopercular flap rounded, the margin thin; interorbital width elevated, convex; nostrils close together, anterior in short tube; first dorsal spine longest, 2.8 in head; longest dorsal rays about middle, 2:1; third anal spine 3.75, longest; middle anal rays longest, 2.3; caudal rounded, 1.6; pectoral pointed, 1.6; ventral pointed, 1.8; ventral spine weak, 2.3 in longest or first ray; scales rather large, thin, cycloid; lateral line high along back, descending below posterior dorsal rays, then running along middle of side of caudal peduncle.

Color in life (No. 03268), bright brownish pink, a large golden area above pectoral; side with about 24 curly white streaks running along rows of scales, these yellow in the golden area, the streaks above lateral line most distinct; head golden olive, with vague bluish shades; upper part of opercle bright yellow, bluish shades placed much as in *C. ballieui*; a bluish streak from eye to first dorsal spine; no black spot on front of dorsal; iris red; dorsal with a row of bluish spots at base, a broad blue band just

below the middle, a narrow blue band above it, the fin otherwise golden; caudal golden with 3 narrow pale bluish bands; anal violet at base, then golden, then a violet stripe, otherwise golden; behind middle of anal violet streaks run obliquely; pectoral pale yellowish; ventrals reddish.

Another example (No. 03310) is richer red, the yellow or golden area above pectoral absent, the curly white stripes most distinct on under part of side; only tips of first dorsal membrane black, edge of fin with dashes of bluish purple.

Color in alcohol, dull brown, many narrow brown lines longitudinally along side; head uniform dull brown with indistinct darker colored pattern shown in figure of *C. ballieui* by Steindachner; fins pale brown, marginal or outer portion of dorsal with 4 narrow pale brown longitudinal lines; anal uniform pale brown; caudal pale brown with 3 or 4 indistinct pale crossbars at base; pectorals and ventrals pale uniform brown.

Described from an example (No. 2552) taken at Honolulu.

This species is near *Coris ballieui*. It differs in having the first dorsal spine short, the color paler, and the marks on anal and caudal indistinct. Rather common at Honolulu.

We have 20 specimens, 17 from Honolulu and 3 from Hilo, 6.5 to 10.4 inches long.

Coris (Hemicoris) rosea Vaillant & Sauvage, Rev. Mag. Zool., III, 286, 1875, Sandwich Islands.

Coris argenteo-striatus Steindachner, Denks. Ak. Wiss. Wien, LXX, 507, taf. III, fig. 1, 1900, Honolulu.

Hemicoris keleipionis Jenkins, Bull. U. S. Fish Comm., XIX, 1899 (Aug. 30, 1900), 51, fig. 6, Honolulu. (Type, No. 6049, L. S. Jr. Univ. Mus.)

Hemicoris argenteo-striatus, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 461 (Honolulu; Dr. Wood).

Hemicoris rosea, Snyder, op. cit. (Jan. 19, 1904), 528 (Honolulu).

248. *Coris venusta* Vaillant & Sauvage. Plate XXXI and Fig. 133.

Head 3.5 in length; depth 3.4; eye 5.7 in head; snout 3.2; mouth 5; interorbital 5; D. ix, 12; A. iii, 12; scales 5-52-17.

Body elongate, compressed, deepest about origin of anal; head much longer than high, pointed; snout long, jaws produced, equal; mouth small, horizontal; lips thick, fleshy; teeth strong, directed forward; 2 canines in front of each jaw directed forward, the lower fitting in between upper; eye small,

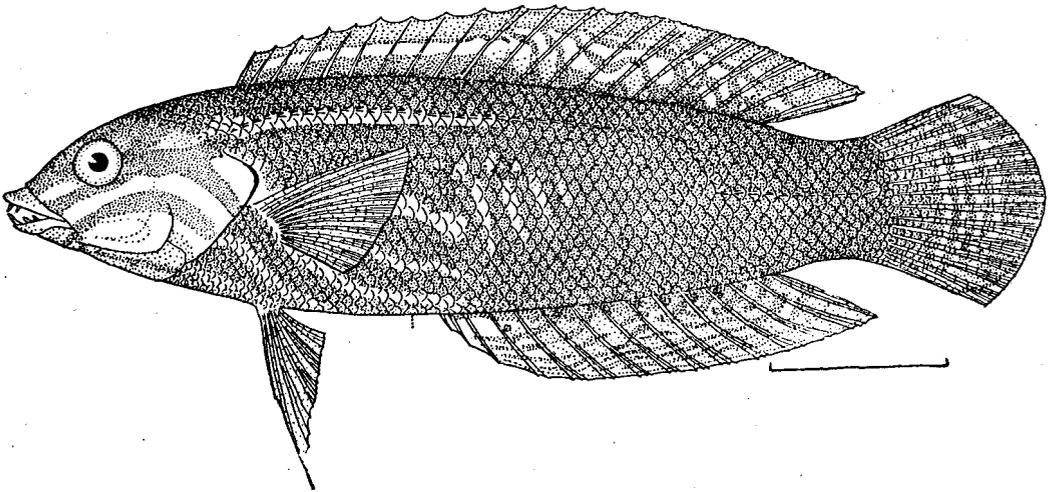


FIG. 133.—*Coris venusta* Vaillant & Sauvage. Type of *Hemicoris remedius* Jenkins.

its posterior rim in center of length of head; interorbital space broad, convex; nostrils small, anterior in very short tube; posterior dorsal spines longest, last 2.8 in head; longest dorsal ray about 1.8; third anal spine 3.2 in head; longest anal ray 2; pectoral 1.5; ventrals long, pointed, 1.2.

Described from an example (No. 4569) from Hilo.

Color in life, brown (No. 6133, L. S. Jr. Univ. Mus.), dark above, light below; a bright red band from eye along lateral line to its downward bend; a bright red band from opercular flap extending

backward to tip of pectoral, from which it is broken up into a series of short oblique crossbars on every alternate row of scales, becoming less distinct toward caudal peduncle; a bright red band curving downward just below anterior portion of middle line of body, becoming indistinct about below vertical from twelfth dorsal spine; another bright red band from axil curving downward and extending backward to about second anal ray; a bright red band from angle of mouth curving upward to lower margin of eye and down to edge of opercle just below flap; a bright red band from a short distance behind symphysis curving upward over cheek and downward across middle of posterior margin of opercle on to breast to a point just behind base of ventrals; a bright red band on each side of middle line of throat; a short red bar at symphysis; a red spot just above and back of eye; anterior portion of opercular flap scarlet, bordered posteriorly first with black then with bright yellow; spinous dorsal with a longitudinal band of red on middle portion, which on soft portion is broken up into small wavy lines and reticulations.

Another example (No. 03351) with greenish-olive side; a pink-red band along lateral line from back of eye to middle of length, then fading and running above lateral line to caudal peduncle; another similar but broader band from gill-opening just above pectoral to middle of length, where it breaks up into spots; between these 2 a series of 5 or 6 small red spots; a narrower red band from axil along lower part of side; head greenish-olive, a broad bluish white bar from eye forward and downward to lip, a similar one under eye forward across cheek and meeting its fellow on lower jaw; base of pectoral bluish with reddish anterior border.

Color in alcohol (No. 04569) dark brown; a pale creamy band from eye along back, another from corner of mouth, touching eye, back and down across opercle toward base of pectoral; side of head below with convex creamy band running down on side of chest behind ventral; opercle with large creamy blotch, angle of flap narrowly black; 4 pale creamy bands radiate from above base of pectoral along side a short distance; vertical fins dark gray; spinous dorsal with median whitish longitudinal line for short distance giving place posteriorly to dark; soft dorsal with dusky brown blotches and marblings; anal with blotches at base, the marginal portion with narrow oblique blackish lines; caudal with dusky crossbars; pectoral and ventrals plain pale brown.

In our smallest example (No. 404) from Honolulu, there is a black spot at bases of last 2 dorsal rays.

This species is generally common on the coral reefs about Honolulu. It is a well-known fish and was formerly supposed to have medicinal value. It bears much resemblance to *Julis multicolor* of Rüppell, a species of still earlier date.

We have 36 excellent specimens (including the 12 examples obtained by Dr. Jenkins), all from Honolulu but 1, which is from Hilo. The *Albatross* also obtained it at Honolulu.

Coris venusta Vaillant & Sauvage, Rev. Mag. Zool., III, 1875, 285, Hawaiian Islands.

† *Coris multicolor* Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 507, pl. v, fig. 2 (Honolulu; Laysan); not of Rüppell.

Hemicoris rymedius Jenkins, Bull. U. S. Fish Comm., XIX, 1899 (Aug. 30, 1900), 49, fig. 5, Honolulu (Type, No. 6133, L. S. Jr.

Univ. Mus.); Jenkins, op. cit., XXII, 1902 (Sept. 23, 1903), 461 (Honolulu).

Hemicoris venusta, Snyder, op. cit. (Jan. 19, 1904); 528 (Honolulu).

249. *Coris aygula* Lacépède. Fig. 134.

Head 3.75 in length; depth 3; eye 7 in head; snout 2.5; interorbital 3.65; depth of caudal peduncle 6; D. IX, 12; A. III, 12; scales 5-61-24.

Body moderately compressed, dorsal contour ascending rapidly from tip of snout to insertion of dorsal, ventral outline more gently and evenly curved; snout short, bluntly pointed; jaws equal, lower lip thin, divided into 2 lateral pendant lobes; teeth closely opposed or coalesced at base, the points distinct, in a single series; 2 strong blunt canines on tip of each jaw, 2 or 4 smaller teeth in a row behind the canines; no posterior canines present; preopercle entire; opercle with a broad flap, its length 5 in head; interorbital space convex; caudal peduncle deep; gillrakers on first arch 6+11, moderately long, slender, pointed; pseudobranchiae large; dorsal spines long and slender, not pungent, the longest 2.5 in head; longest dorsal ray 1.8; anal spines similar to those of dorsal, the rays equal to those of dorsal in length, the membranes of both fins thick; outer rays of ventrals lengthened, the fins reaching base of first anal ray; scales moderate, much reduced on nape and on pectoral region; dorsal and anal fins without basal sheath; small scales extending far out on interradiial membranes of caudal; head naked; lateral line complete, abruptly bent downward below base of soft dorsal.

Color in life, deep green, the scales edged with brownish; a bluish-green vertical band behind end of depressed pectoral; caudal with a wash of blue on posterior parts; dorsal and anal with golden brown reticulations.

Color in alcohol, uniform blue-black, the scales with a somewhat lighter edge, the fins much darker than the body.

This species, here described from a large example from Wakanoura, Japan, has been once recorded from Hawaii by Mr. Fowler; a record open to doubt, however.

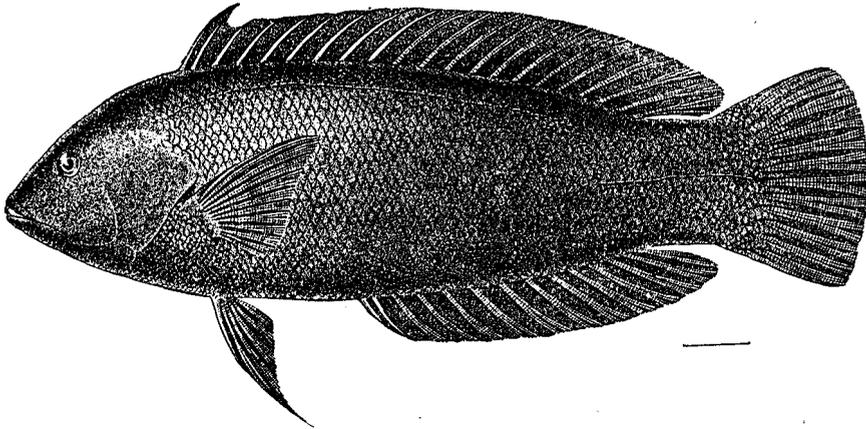


FIG. 134.—*Coris aygula* Lacépède; after Jordan and Snyder.

Coris aygula Lacépède, Hist. Nat. Poiss., III, 96, pl. 4, fig. 1, 1801, Ile de France; Günther, Cat., IV, 1862, 201 (Red Sea; India; Australia); Day, Fish. India, 408, 1877, (with a figure representing some species of *Hologymnosus*); Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 510 (Sandwich Islands); Jordan & Snyder, Proc. U. S. Nat. Mus., XXIV, 1902, 641, fig. 9 (Wakanoura, Japan).

Coris angulata Lacépède, Hist. Nat. Poiss., III, 96, pl. iv, fig. 2, 1801, Ile de France (dorsal spines not produced).

Julis gibbifrons Quoy & Gaimard, Voy. Astrolabe, Poiss., 707, pl. xix, fig. 3, 1830, Ile de France.

Julis coris Cuvier & Valenciennes, Hist. Nat. Poiss., XIII, 491, 1839, Ile de France.

Genus 159. CHEILIO (Commerson) Lacépède.

Body elongate, compressed, covered with rather small scales, 45 to 50 in the lateral line; lateral line continuous; cheeks scaleless; a few rudimentary scales on the opercle; teeth small, in one series; no posterior canines; dorsal spines flexible; fins not produced; dorsal ix, 13; anal iii, 11. Polynesia to Africa; apparently a single species, varying much in color.

Cheilio (Commerson) Lacépède, Hist. Nat. Poiss., IV, 432, 1802 (*auratus*).

Hemidulis Swainson, Nat. Hist. Fishes, II, 228, 1839 (*vittatus*).

Eupemis Swainson, Nat. Hist. Fishes, II, 232, 1839 (*fusiformis*).

250. *Cheilio inermis* (Forskål). “Κυρβυρού.” Plate XXXIII.

Head 2.8 in length; depth 4.6; eye 9.6 in head; snout 2.25; maxillary 3; interorbital 5.6; D. ix, 13; A. ii, 12; scales 5–48–10.

Body very elongate, compressed, deepest at pectoral; upper profile of head concave, then convex to occiput; mouth large, upper jaw slightly projecting; snout and jaws produced; maxillary reaching under posterior nostril; lips thick, fleshy; teeth strong, conic, interorbital width broad, convex; nostrils small, close together, posterior a little less than eye diameter from front of eye; margin of preopercle undulate; dorsal spines pungent, tips flexible, longest 3.8 in head; longest dorsal ray 3.7; longest anal ray 3.7; margin of caudal a little convex, 2 in head; pectoral small, 2.5; ventrals 4.25; scales large, thin; lateral line almost straight to base of caudal, tubes very arborescent.

Color in life (No. 03244), olive-green, varying toward rusty red, each scale with a more or less distinct curly blue spot, bluish shades predominating below; head with various streaks and reticula-

tions of olive, brownish and pearly blue; middle of side with a narrow dark streak which breaks up posteriorly into a row of blackish spots; dorsal light orange, the color forming reticulations around pearly spots; anal similar; caudal dirty, olive-gray; with a paler cross shade; pectoral and ventrals colorless.

Three smaller examples (Nos. 03245, 03246, and 03247) have the ground color light olivaceous orange rather than greenish, a dark lateral band much more distinct and traceable across eye to tip of snout; dorsal plain translucent without trace of spots or reticulations; caudal dull green, the dark lateral band forming a dark mesial shade to its tip; anal and pectoral colorless; vent and anal spine light blue; ventrals light blue, lower ray of pectoral blue; No. 03244 has a brown spot at axil, the others reddish spots. Another (No. 03348) bright golden; snout orange; lateral stripe black, more or less distinct; fins plain golden; a few pearly blue spots on scales of lower parts.

Example No. 03039 had a large black blotch on each side when fresh, and one taken at Honolulu July 19, 1900, when fresh was bright lemon-yellow over whole of body and fins, with the usual row of black spots.

Color in alcohol, uniform brown above, abdomen whitish; blackish blotch above tip of pectoral, with several white scales; fins pale brown, dorsal and anal with pale oblique crossbars, caudal with brown spots on membrane.

This species is subject to great variation in shade of color. It is common in the markets at Hilo and Honolulu. Our collections contain 62 specimens from Honolulu (12 collected by Dr. Jenkins and 1 by the *Albatross* in 1896) and 4 from Hilo. These are 1.8 to 16.5 inches long. Common at Samoa.

Labrus inermis Forskål, Descript. Animal., 34, 1775, Red Sea.

Labrus hassck Lacépède, Hist. Nat. Poiss., III, 513, 1801; after Forskål, Arabian Sea.

Cheilio auratus Lacépède, op. cit., IV, 433, 1802, Ile de France; Quoy & Gaimard, Voyage de l'Uranie, Zool., 274, pl. LIV, fig. 2, 1824 (Maui; Hawaii); Cuvier & Valenciennes, Hist. Nat. Poiss., XIII, 1837, 341 (Ile de France).

Cheilio fuscus Lacépède, op. cit., IV, 433, 1802, Ile de France; Cuvier & Valenciennes, XIII, 1839, 349 (same type).

Labrus fusiformis Rüppell, Neue Wirbelthiere, Fische, 7, pl. 1, fig. 4, 1838, Djidda, Massuak.

Hemulius auratus, Swainson, Class. Fish., II, 228, 1839.

Eupemis fusiformis, Swainson, op. cit., II, 232, 1839.

Cheilio cyanochloris Cuvier & Valenciennes, Hist. Nat. Poiss., XIII, 346, 1839, Ile de France.

Cheilio forskalti Cuvier & Valenciennes, op. cit., XIII, 349, 1839, Red Sea.

Cheilio hemichrysos Cuvier & Valenciennes, op. cit., XIII, 351, 1839, Sandwich Islands.

Cheilio viridis Cuvier & Valenciennes, op. cit., XIII, 352, 1839, Vanicolo.

Cheilio microstoma Cuvier & Valenciennes, op. cit., XIII, 353, 1839, India.

Cheilio ramosus Jenyns, Voyage Beagle, Fish., 102, 1842, Japan.

Cheilio inermis, Richardson, Ichthy. China, 258, 1846 (Canton); Bleeker, Atlas, I, 82, 1862, pl. 31, fig. 4 (Java, Bawain, Sumatra, Celebes, Tonga, Ternate, Amboyna, Banda, Ceram, Goram, Buro, Timor, Letti); Günther, Cat., IV, 194, 1862 (Mozambique, Macassar, Amboyna, Philippines, Aneityum); Klunzinger, Verh. Zool. Bot. Ges. Wien, XXI, 1871, 530 (Red Sea); Streets, Bull. U. S. Nat. Mus., No. 7, 65, 1877 (Honolulu); Day, Fish. India, 407, pl. 88, fig. 4, 1877 (Malay Archipelago); Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 511 (Sandwich Islands); Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 507 (Honolulu); Jordan & Evermann, Proc. U. S. Nat. Mus., XXV, 1903, 355 (Formosa); Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 462 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 528 (Honolulu).

Cheilio auratus, Peters, Monatsb. Ak. Wiss., Berlin, 1855, 463.

Cheilio bicolor Bianconi, Mem. Ac. Soc. Bologn., VIII, 1859, 46, pl. 25.

Genus 160. CIRRHILABRUS Schlegel.

Body compressed, oblong, covered with large scales, 20 to 25 in the lateral line; lateral line interrupted; forehead not elevated nor trenchant; cheeks and opercles with imbricated scales; preopercle serrated; teeth in one series, with canines anteriorly; no posterior canine; D. xi, 9; A. iii, 9; ventrals much produced (*Cirrhilabrus*), or short (*Cheilinoïdes*).

Cirrhilabrus Schlegel, Fauna Japonica, Poiss., 167, 1845 (*temmincki*).

Cheilinoïdes Bleeker, Natuurk. Nederl. Ind., II, 71, 1851 (*cyanopectora*).

251. *Cirrhilabrus jordani* Snyder. Plate 42, fig. 1.

Head measured to end of opercular flap 2.8 in length; depth 3.45; depth of caudal peduncle 7; length of snout 3.1 in head; eye 4; interorbital space 4.3; D. xi, 8; A. iii, 8; scales in lateral line 16+8; between lateral line and dorsal 1; between lateral line and anterior part of anal 5.

Snout pointed; cleft of mouth 1.3 in eye; 6 rather widely spaced canines in upper jaw; inner pair projecting forward; the others, of which the outer pair are much the longer, curve outward and backward; 2 small canines in lower jaw; no posterior canines; other teeth very small, sharp, and closely apposed; preopercle with a finely serrated margin. Cheeks and opercles with scales; bases of dorsal and anal, each with a row of long, pointed scales; 3 large scales covering the greater part of basal half of caudal; dorsal and anal fins high; dorsal spines slender, the longest (posterior ones) equal in length to twice diameter of eye, each with a fleshy, spine-like prolongation, a continuation of the thickened membrane surrounding the spine, extending upward and backward and acting as a support for the membrane which extends above spines; first ray equal in height to preceding spine and its thickened attachment, the following rays gradually growing shorter; anal spines with thickened membranous attachments similar to those of dorsal, the rays longer than the spines, their length contained about 1.5 times in head; caudal rounded; ventrals sharply pointed, not greatly elongated, reaching to vent when depressed; upper rays of pectoral longest.

Flesh color in alcohol, probably red in life; a pale purple stripe indistinctly outlined extending along body between base of dorsal and lateral line; a few small white spots scattered along back above lateral line; 3 distinct, narrow, light stripes along side of abdomen. Fins plain, probably yellow in life; anal with a narrow dusky band on margin.

The specimen described is a male, type, No. 50878, U. S. Nat. Mus., from Albatross station 3876, between Maui and Lanai; depth 28 to 43 fathoms.

Other examples, females from the same locality, among them cotypes, No. 7728, Stanford University, have the spinous dorsal lower than the rayed portion of the fin. The thickened portions of the membrane are less developed. The anal has no dusky border.

The following measurements of the type and cotypes are given in hundredths of the length:

	No. 1.	No. 2.	No. 3.
Length from tip of snout to base of caudal, in millimeters.....	65	56	50
Length of head, including opercular flap.....	.36	.33	.33
Length of longest (11th) dorsal spine.....	.16	.15	.15
Length of longest (1st) dorsal ray.....	.23	.2	.18
Length of longest (3d) anal spine.....	.13	.13	.1
Length of longest (4th) anal ray.....	.25	.17	.2
Length of caudal fin.....	.27	.26	.29
Length of pectoral fin.....	.22	.23	.24
Length of ventral fin.....	.23	.21	.2
Number of dorsal rays.....	XI, 8	XI, 8	XI, 9
Number of anal rays.....	III, 8	III, 9	III, 9
Number of scales in lateral line.....	16+8	15+7	16+8

This species belongs with *Cheilinooides* Bleeker, a section of the genus *Cirrhitilabrus*, having short ventrals.

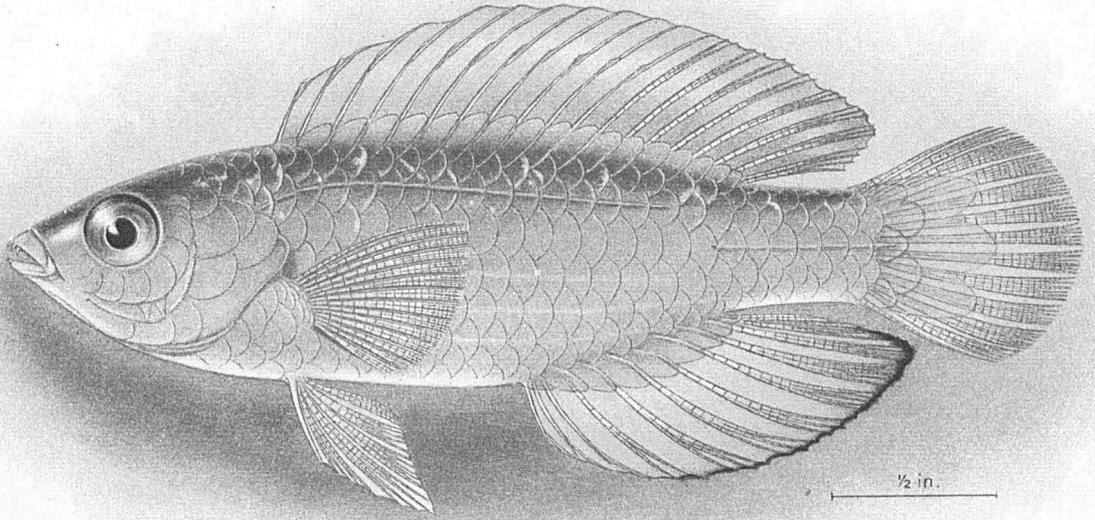
Cirrhitilabrus jordani Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 529, pl. 10, fig. 18, Albatross Station 3876, between Maui and Lanai.

Genus 161. PSEUDOCHEILINUS Bleeker.

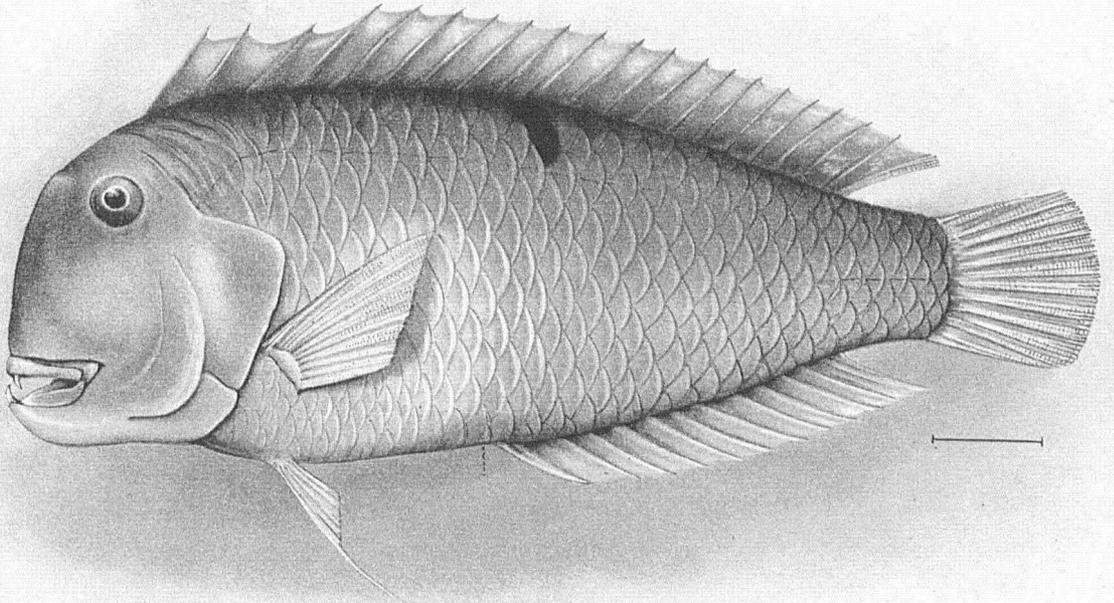
Body compressed, oblong, covered with large scales; lateral line interrupted; cheek with 2 series of large scales; preopercle entire; teeth in a single series; the upper jaw with a pair of very large canine teeth bent outward and backward; no posterior canine tooth; lower jaw not produced backward; 9 dorsal spines, subequal in length; 3 anal spines, the middle one the longest. Eye with the cornea peculiarly modified.

Pseudocheilinus Bleeker, Proc. Zool. Soc. Lond. 1861, 409 (*Cheilinus hexatania*).

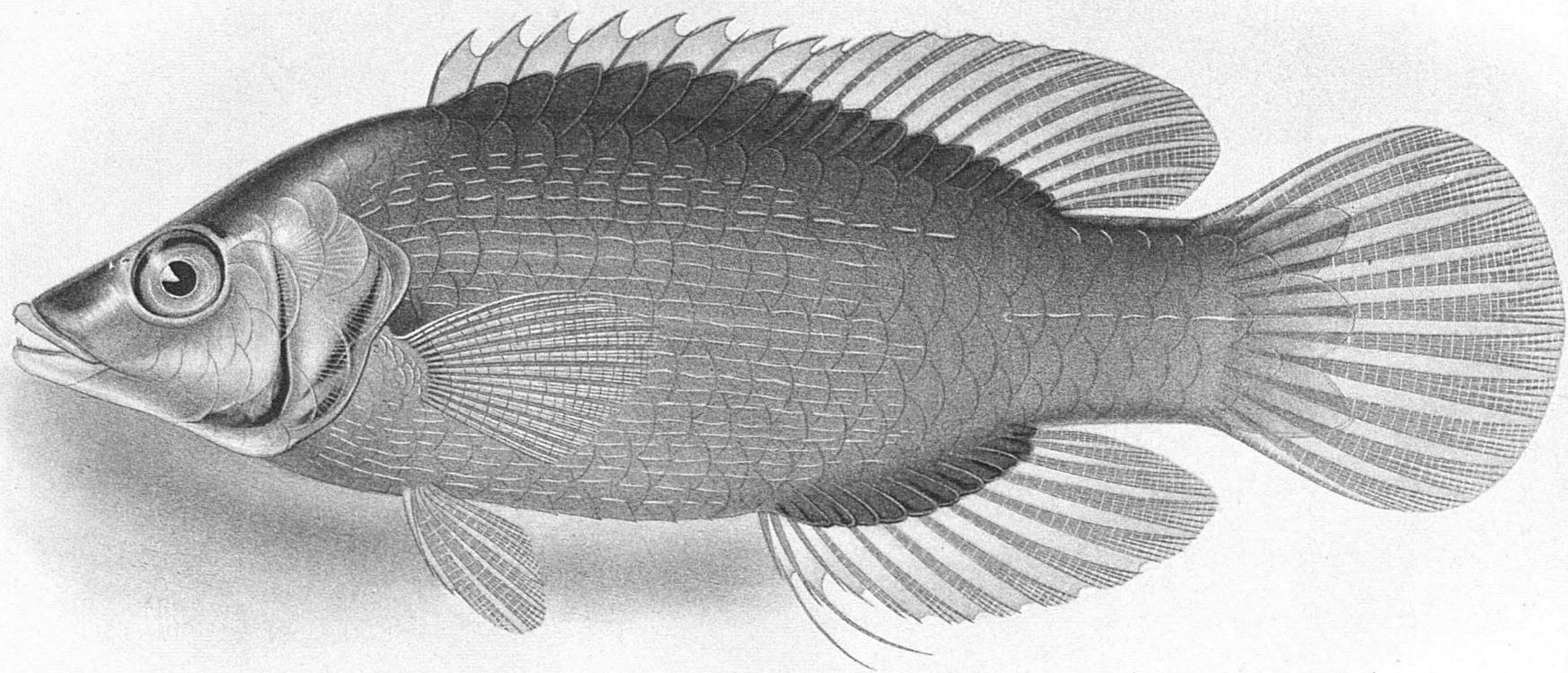
- a. Body comparatively slender, depth about 3.8 in length; eye 4.5 in head; gape reaching anterior margin of orbit. Color in life, body dull brick red; belly and base of anal pale purplish; about 7 longitudinal yellowish streaks along side.....*evanidus*, p. 317
- aa. Body deeper, depth about 3.2 in length; eye larger, 5 in head; gape not reaching anterior margin of orbit. Color in life, brownish red, anterior half coppery, the posterior half grayish; side of body with 8 dark longitudinal stripes.....*octotania*, p. 317



1. CIRRHILABRUS JORDANI SNYDER.



2. HEMIPTERONOTUS JENKINSI SNYDER.



PSEUDOCHEILINUS EVANIDUS JORDAN & EVERMANN. TYPE.

252. *Pseudocheilinus evanidus* Jordan & Evermann. Plate 43.

Head 3 in length; depth 3.8; eye 4.5 in head; snout 3; preorbital 6.2; interorbital 5.5; D. ix, 11; A. iii, 9; scales 2-25-6.

Body short, deep and compressed; head long, conic; snout long, sharply conic; anterior profile rising in a relatively straight line from tip of snout to nape, thence gently convex to base of caudal peduncle; ventral outline less convex; mouth large, horizontal, below axis of body, gape reaching anterior line of orbit; upper jaw with 3 pairs of anterior canines, outer strongest, curved outward and backward; lower jaw with a single pair at tip, similar to inner above; jaws laterally with a single series of smaller conic teeth; preorbital narrow, oblique; eye high up, its lower border on axis of body; interorbital space rather broad and flat; depth of caudal peduncle about 2 in head; scales large, surfaces finely striate; head, nape, and breast with large scales; lateral line following contour of back until under base of sixth dorsal ray, where it is interrupted, reappearing 2 rows farther down and continuing on 6 or 7 scales to base of caudal fin; fins rather large; dorsal spines somewhat greater than eye in length, spines with a sheath of large scales reaching nearly to their tips; soft dorsal and anal with a lower sheath; soft dorsal elevated, rays equal to snout and eye; anal similar to soft dorsal, second spine strongest, nearly as long as snout; anal rays somewhat longer, equaling those of soft dorsal; caudal rounded, its length 1.3 in head, its base covered with very large, thin scales.

Color in life, according to Mr. Sindo, body dull brick-red; belly and base of anal pale purplish; about 17 thin, thread-like longitudinal yellowish streaks along side anteriorly; dark greenish blotches above eye and on snout; a bluish horizontal bar on cheek, below which is a yellow bar; median line of throat and tip of snout brick-red; edges of opercle and preopercle bright purple; a purple stripe with reddish edges through middle of dorsal fin, below which the color is dull brick-red, like that of body, and above which the spinous dorsal is orange-yellow, the margin of the membranes bright cardinal-red; above the purple streak in the soft dorsal is a bright yellow streak, above which the fin is cardinal-red, fading gradually upward; dorsal rays purplish; tip of soft dorsal somewhat red; caudal rays purple, the membranes immediately next to the rays yellow, middle part dull brick-red; anal same as caudal; ventrals pale purplish; pectoral pale; iris scarlet-red.

The same specimen after having been in spirits more than a year has the body light brownish blue; a pale streak along each row of scales, but no trace of the narrow yellowish streaks above noted; top of head and upper part of cheek dusky blue; opercle and edge of preopercle rich blue; dorsal, anal, and caudal fins bright blue, the soft dorsal pale on the outer two-thirds, dorsal rays bright blue; ventrals and pectoral light blue, latter darker blue at base. The color of this specimen in spirits is wholly different from that which it possessed in life, and it would be difficult to believe that such changes had taken place except that the specimen was carefully tagged when the color note in life was taken.

Since writing the above, we have noticed similar changes in the Samoan species, *P. hexatænia*. The blue shades are permanent in spirits, while the pink or crimson wash soon vanishes.

The 17 thread-like streaks, mentioned in Mr. Sindo's field notes above, have vanished entirely in the original type. A number of specimens taken at Laysan by the *Albatross* retain these marks, the streaks being almost white, like white threads, covering most of the side anteriorly. This is a very peculiar color mark, which should well distinguish the species in life.

A single specimen, type No. 50678, U. S. N. M. (field No. 05757), was taken by Mr. Sindo in Henshaw's pool near Hilo, a deep tide pool in the lava rocks.

Pseudocheilinus evanidus Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (April 11, 1903), 192, Henshaw's pool, near Hilo, Hawaii; Snyder, op. cit. (Jan. 19, 1904) 530, (Albatross Stations 3873, 3876, and 4073, Hawaiian Islands).

Pseudocheilinus hexatænia, Streets, Bull. U. S. Nat. Mus., No. 7, 63, 1877 (Honolulu); not of Bleeker.

253. *Pseudocheilinus octotænia* Jenkins. "*Aleihi lakea*." Plate XXXVII and Fig. 135.

Head 2.8 in length; depth 3.2; eye 5 in head; snout 2.7; preorbital 6.5; interorbital 5.75; D. ix, 10; A. iii, 9; scales 2-23-6.

Body moderately deep and compressed; head very long and pointed; snout long and pointed; the lower jaw slightly the shorter; anterior profile from tip of snout to origin of dorsal straight, ascending at an angle of about 35°; body deepest at origin of dorsal; mouth rather large, but narrow, nearly horizontal, the gape reaching not quite to vertical of eye; lower jaw with 1 pair and the upper jaw

with 3 pairs of enlarged canine-like teeth in front and a series of smaller close-set teeth laterally, the canines sometimes not developed; premaxillaries strongly protractile; skin on lips at sides broad and flap-like; eye rather large, its lower edge on axis of body; scales large, smooth, firm, the surfaces very finely striate; cheek and opercles scaled, 2 rows on cheek; lateral line following curvature of back to scale under base of last dorsal ray, where it is broken, beginning again on scale in same series 2 rows lower, or sometimes in same series 2 scales more anterior; fins rather large; dorsal beginning over base of pectoral, membranes of spines extending beyond their sharp tips, longest dorsal spine about equal to snout, last dorsal ray somewhat produced; anal similar to soft dorsal, the spines and rays about equal to snout; caudal rounded, equal to snout and eye; ventrals short, equal to snout; pectoral rounded equal to snout and pupil.

Color in life, brownish red, the anterior half coppery, the posterior half grayish; side of body with 8 nearly black longitudinal stripes following along the rows of scales, narrower than the interspaces, broadest and most distinct posteriorly, the upper one fading under the dorsal, sometimes traces of a faint ninth line; a faint median streak from nape to front of dorsal preceded by a distinct white streak from vertex to tip of mouth; head vaguely mottled purplish and orange, the opercles largely orange; spinous dorsal dull purplish at base, then dull blue, followed by dull yellow, the fleshy tips crimson; soft dorsal mostly orange yellow, reticulated with bluish, dull purplish at base with a dull bluish streak above it; anal like soft dorsal; caudal bright orange-yellow; pectoral and ventrals dull pink.

The same specimen in alcohol is pale brownish white, the longitudinal stripes black or dark brown; head dusky yellowish; fins bluish and yellowish green; base of caudal most yellowish.

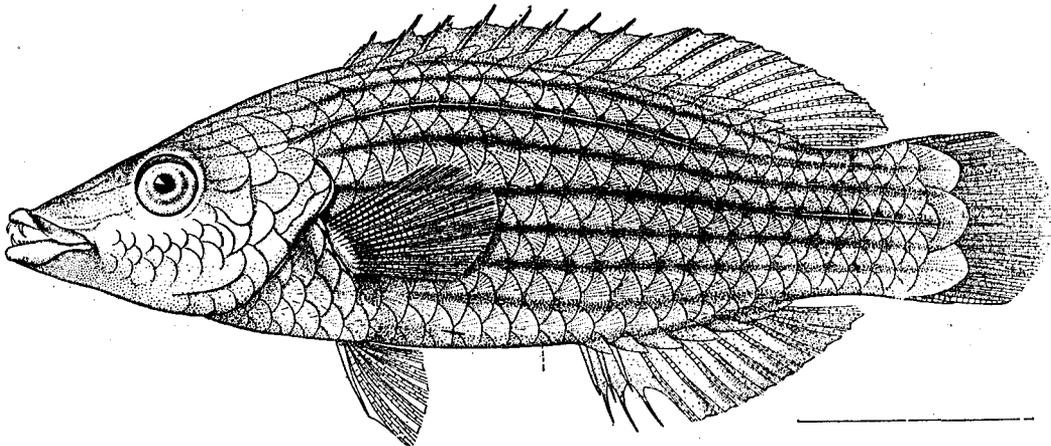


FIG. 135.—*Pseudocheilinus octotenia* Jenkins; from the type.

Another specimen (No. 03498) in life showed the body purple-lake or claret color, with 7 black lines running laterally through the body; the second line from the top runs over the upper lateral line, and the posterior portion of the fourth line over the lower lateral line; head same color as the body, but without the black bars, except the occipital region, which has 4 thin black streaks which are continuous with those of the body; cheek with yellow dots in irregular rows; several (about 5) purple streaks radiate from eye, which may be continuous with the black bars on the body in living examples; interorbital space and top of snout with rose-red streaks running along the median line; lips bright rose-red, a yellowish red streak over eye; spinous dorsal with 3 purple and 2 yellow bars, which are slightly wavy, alternating each other, ending on tip with a purple bar; the yellow preponderates in the soft dorsal, in which the purple bars are reduced to very thin streaks; rays purple; caudal fin bright yellow; anal same as the soft dorsal; pectorals and ventrals plain, pale claret.

The above description is based upon a specimen (No. 03238) obtained at Honolulu, June 11, 1901. The species was found at Honolulu by Wood, Jordan and Snyder, by us, and by the *Albatross*, and by us at Hilo. The 19 specimens examined are 3.6 to 5.2 inches long.

Pseudocheilinus octotenia Jenkins, Bull. U. S. Fish Comm., XIX, 1899 (Aug. 30, 1900), 64, fig. 22, Honolulu (type, No. 6122 Stanford Univ. Mus. Coll., Mr. Kaleipio); Jenkins, op. cit., XXII, 1902 (Sept. 23, 1903), 464 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 530 (Honolulu).

Genus 162. CHEILINUS Lacépède.

Body oblong, compressed, covered with large scales, 20 to 25 in lateral line; lateral line interrupted; cheek with 2 series of large scales; opercles scaly; preopercle entire; teeth in 1 series, 2 canines in front of each jaw, not bent backward nor outward; no posterior canine; lower jaw not produced backward; lips thick; dorsal spines subequal; D. IX, 10 (rarely X, 9); A. III, 8.

Fishes of Polynesia and the East Indies, usually brightly colored, the shades chiefly red and green.

Cheilinus Lacépède, Hist. Nat. Poiss., III, 520, 1801 (*trilobatus*).

Erichthys Swainson, Nat. Hist. Fishes, II, 224, 1839 (*lunulatus*).

Crassilabrus Swainson, op. cit., 225 (*undulatus*).

Thaliburus Swainson, op. cit., 230 (*blocht-chlorurus*).

Oxycheilinus Gill, Proc. Ac. Nat. Sci. Phila. 1862, 143 (*arcnatus*).

a. Caudal rounded, upper and middle rays not produced *hexagonatus*, p. 319

aa. Caudal with upper and middle rays produced.

b. Upper caudal ray usually longer than head; head about 3 in length; eye about 5 and snout about 3.25 in head. Size small. *bimaculatus*, p. 320

bb. Upper caudal ray shorter than head; head about 2.6 in length; eye about 6 and snout about 2.7 in head *trilobatus*, p. 322

254. *Cheilinus hexagonatus* Günther. "Pool." Fig. 136.

Head 2.4 in length; depth 2.75; eye 6.5 in head; snout 2.4; maxillary 2.6; interorbital 4; D. IX, 10; A. III, 9; scales 3-24-6.

Body elongate, oblong, compressed, deepest about ventral fin; head elongate, its depth 1.4 in its length; upper profile of head slightly convex to origin of dorsal; snout long pointed, rounded; mouth

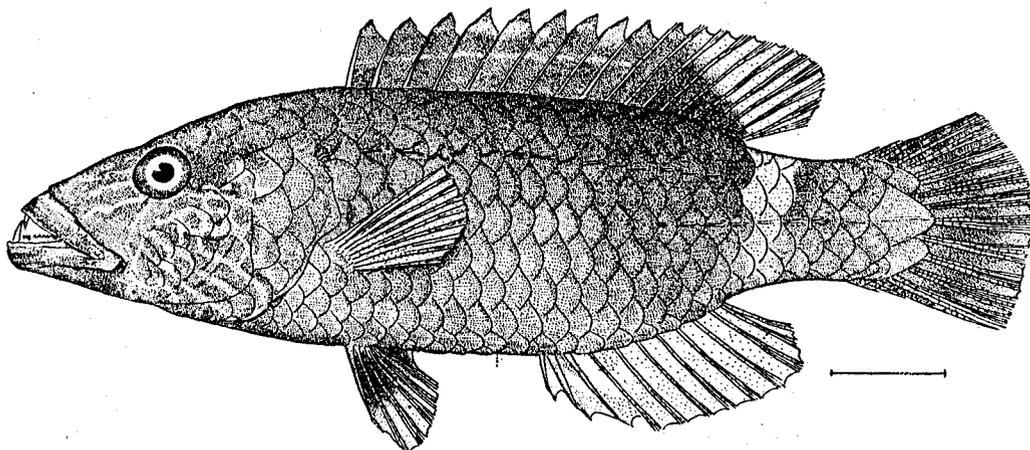


FIG. 136.—*Cheilinus hexagonatus* Günther. Type of *C. zonurus* Jenkins.

large, oblique; jaws large, strong, lower slightly projecting; teeth in jaws forming sharp cutting edge along sides, rather small, sharp pointed, compressed; 2 enlarged sharp canines in front of each jaw, lower fitting in between upper; eye rather small, anterior; margin of preopercle undulate; interorbital space convex; nostril in short tube in front of eye; last dorsal spine 3.75 in head; eighth dorsal ray 3; third anal spine longest 3.4; sixth anal ray 2.6; caudal rounded; pectoral short, rounded, 2.25 in head; ventral short, rounded, 2.5; scales large, thin, cycloid; lateral line straight above, interrupted below last dorsal rays, then beginning low and running straight out on base of caudal. Described from an example (No. 04296) from Honolulu.

Color in life (No. 3506) dull drab above, each scale with a vertical bar of vermilion red; lower surface rosy; markings on head cadmium with a ground-color of dull brownish, neutral tint; dorsal with 3 longitudinal bars of cadmium, interspaces dull-greenish blue; anal venetian red with a faint yellow median longitudinal bar, more distinct anteriorly; caudal rays green, membranes yellow, narrow posterior border red; pectoral yellowish toward base, pink distally; ventrals rosy, with black

blotch on proximal half; a light pink zone around anterior portion of caudal peduncle, showing also on posterior end of dorsal.

Color in life of example from Hilo, head livid violet brown, the varied marks orange, posteriorly scarlet; body reddish brown, each scale with a bright red bar, redder in the young than in the adult; caudal peduncle olivaceous, the fin in the adult with blue or olive rays, the tip red; bar across caudal peduncle light pinkish; dorsal dull olive green or brown with orange marks or lines, the last rays pinkish like the crossbar; anal rosy; ventrals rosy, with a red-black blotch on the inner side; pectoral orange, scarlet at base; jaws and throat livid bluish. Smaller examples show no blue on caudal rays. Young are very rosy. Bones and teeth bluish green.

Another example from Hilo had the anterior half of the body dull olive when fresh, posterior becoming more reddish with varied marks of bright orange, those about eye yellow alternately with livid blue; eye blue with yellow streaks; iris red; posterior part of dorsal and anal clear orange pink; dorsal dusky, edged and mottled with reddish; anal with more red, shaded with dusky; caudal light orange, barred and dotted with light olive and with 2 washes of black, 1 basal and terminal; a black spot edged with bright yellow behind eye; another near middle of side not ocellate.

Color in alcohol, dull brown, darker on back; head grayish with narrow pale lines above; below eye oblique pale lines running down across preopercle, subopercle, and interopercle, inclosed above by narrow line beginning behind corner of mouth and running up below eye and across to axil of pectoral; a pale vertical streak across caudal peduncle below basal portion of last dorsal rays; dorsal grayish with 2 narrow pale longitudinal streaks and base of last rays pale; anal pale, rays greenish, posteriorly dusky on outer portion, a median pale longitudinal line; caudal greenish, edged above and below with brownish; pectoral and ventrals pale brownish, latter tinged with dull greenish, basally blackish brown.

This species is very common about Hawaii, coming daily into the markets of Honolulu and Hilo, from which places we have 26 specimens 5.5 to 10.25 inches long. Günther records the species from Yap Island, and the *Albatross* obtained it at Honolulu and off Molokai. Known also from Johnston Island.

Cheilinus hexagonatus Günther, *Fische der Südsee*, VII, 247, pl. 135, fig. B, 1881, Yap Island; Snyder, *Bull. U. S. Fish Comm.*, XXII, 1902 (Jan. 19, 1904), 530 (Honolulu and station 3834, off southern coast of Molokai).

Cheilinus digranma, Smith & Swain, *Proc. U. S. Nat. Mus.*, V, 1882, 133 (Johnston Island); not of Lacépède.

Cheilinus zomurus Jenkins, *Bull. U. S. Fish. Comm.*, XIX, 1899 (Aug. 30, 1900), 56, fig. 13, Honolulu (type, No. 6134, Stanford Univ. Coll. Dr. Jenkins); Jenkins, *op. cit.*, XXII, 1902 (Sept. 23, 1903), 434 (Honolulu).

255. *Cheilinus bimaculatus* Cuvier & Valenciennes. Plate XXXVIII.

Head 3 in length; depth 2.9; eye 5 in head; snout 3.25; preorbital 5.5; interorbital 4.5; D. ix, 10 or 11; A. iii, 8 or 9; scales 2-22-6.

Body short and deep; dorsal profile evenly and gently curved from tip of snout to last dorsal ray; ventral outline somewhat less convex; head conic; snout moderate, bluntly pointed; mouth rather large, slightly oblique; maxillary nearly reaching vertical of eye; each jaw with a pair of strong canines in front and a series of shorter teeth laterally; eye moderate, the lower edge on line of axis of body; interorbital rather broad, moderately convex; fins high; origin of dorsal over gill-opening; first dorsal spine short, the others longer, their length equal to distance from tip of snout to middle of pupil; dorsal rays somewhat higher, their length 1.9 in head; anal similar to soft dorsal, its last rays but one somewhat produced, making the fin pointed; caudal usually with the upper and middle rays greatly produced and filamentous, the produced rays usually consisting of 1 upper and 3 or 4 middle rays; middle rays sometimes little produced; lower caudal rays usually not produced, the tip of the fin forming a sharp angle; ventrals reaching two-thirds of way to origin of anal, their length 1.8 in head; pectoral short, broad and rounded, the upper rays scarcely longer than the lower, 2 in head; scales large, those on nape and breast not reduced; head covered with large scales; lateral line ceasing at base of soft dorsal ray, beginning again 2 scales lower down and 1 to 3 scales anteriorly and continuing to base of caudal. Description based chiefly upon a specimen (No. 03002) 5 inches long, from Honolulu.

Color in life of a nearly fresh specimen, taken at Honolulu June 7, rosy or brick-red, greenish on back, paler below; blackish blotches on caudal peduncle, a small black spot on middle of side below lateral line, below sixth dorsal spine; anterior part of side vermiculated with orange-red on borders of

scales, which are yellowish green; head and nape purplish, with narrow reddish orange or yellow lines radiating from eye, those toward snout reddest, those backward more yellow; 2 greenish yellow bars on opercle, which is yellowish green above and bluish below; dorsal pale, specked with olive or brownish, edge of fin red; membrane of anterior ray with a blue spot bounded above by a similar bright red border; last few dorsal rays pale, with rosy specks, yellowish toward tips; caudal mottled greenish and reddish on basal half of rays, elsewhere mottled rosy, yellowish, greenish, and white, the border narrowly blue; anal flesh-color at base, mottled reddish, grayish and greenish on distal parts, the border blue; pectoral and ventrals pale rosy, the latter somewhat mottled with greenish, reddish, and white; iris bluish olive, with radiating orange lines; tip of lower jaw dark bluish, paler on the throat.

This same specimen, after having been in spirits one year, is dusky white, palest below; the lines and markings on the head have changed to pale sulphur-yellow, as likewise the border to the scales on anterior part of body; the dark greenish postocular spot has become dark brown, almost black, and the green of the side pale; the black lateral spot persists; the blue spot on anterior portion of dorsal has become black, and the red above it has faded to pale lemon. In some specimens the black lateral spot is absent on one or both sides, while occasionally in other specimens it is duplicated and appears as a double spot on at least one side. Most specimens show in spirits traces of 4 or 5 broad dark bars, and a dark blotch on basal part of caudal fin.

Another specimen (No. 03350) in life was scarlet, a little olivaceous on back, the color deepest behind opercular flap and produced by a vertical spot on each scale; side of head green, with scarlet line radiating from eye, irregular in position; a brown spot behind eye; a jet black round spot larger than pupil below seventh scale of lateral line; a black ocellus behind middle of first dorsal spine, rest of dorsal with red reticulations around pale spots; caudal and anal similar; soft fins whiter than spinous portion; ventrals whitish, reticulated with red; pectoral pale with a red streak at base. An example (No. 03343) 4.25 inches long, taken at Honolulu, June 14, when nearly fresh had the back and upper parts of side and head brick-red, mottled with dark olive; 2 rows of scales below lateral line with the entire margin orange-red; 3 or 4 faint round dusky spots above lateral line anteriorly; a conspicuous black spot just below lateral line beneath fifth and sixth spines; caudal peduncle dusky underlaid with rosy; snout and interorbital space with irregular greenish white lines; whiter lines radiating forward and coppery ones backward from eye; a large brownish spot back of eye bounded by coppery orange; opercle in front of pectoral greenish, with 2 obscure coppery stripes; under parts paler, the scales with pale orange centers; margin of lower jaw white, rest black; middle line of throat black; dorsal blackish brown, the sheathing scales dusky rosy; first ray blood-red on outer two-thirds, followed by a black spot; margin of fin with a narrow white line, tips of the ray rosy, posterior 6 or 7 rays yellow; caudal with upper half yellow with rosy splotches, median rays with a large blackish blotch on basal half, outer half and lower part of fin greenish yellow; anal greenish olive, posterior margin greenish yellow, with rosy splotches; pectoral pale rosy, yellow on base; ventrals dusky anteriorly, paler on inner rays, crossed by about 4 rows of orange-red spots; iris olive with spots and lines of orange.

This little fish is one of the most beautiful of the many brilliant fishes found among the Hawaiian Islands. The extreme delicacy and beauty of the markings are well shown in the exquisite painting by Mr. Hudson which accompanies this report.

The species was originally described from the Hawaiian Islands, being found among the coral rocks, where it is apparently not uncommon. We have examined 40 specimens from Honolulu, and 1 from Hilo, all of small size, rarely exceeding 5 inches in length. Other specimens were obtained by the *Albatross* at Honolulu.

Cheilinus bimaculatus Cuvier & Valenciennes, Hist. Nat. Poiss., 14, 96, 1839, "L'île Onarourou" (Honolulu), Coll. Eydoux & Sonjeyet; Günther, Cat., IV, 131, 1862 (Hawaiian Islands); Günther, Fische der Südsee, VII, 246, 1881 (Honolulu); Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 504 (Honolulu); Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 464 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 530 (Honolulu).

? *Cheilinus ceramensis* Bleeker, Nat. Tijds. Ned. Ind., III, 290, 1852, Ceram; Günther, Cat., IV, 127, 1862 (Amboyna; Aneityum.)

256. *Cheilinus trilobatus* Lacépède.

Head 2.6 in length; depth 2.6; eye 6 in head; snout 2.7; maxillary 3; preorbital 3.6; interorbital 3.6; least depth of caudal peduncle 2.2, least width 12; D. IX, 10; A. III, 8; P. 11; V. I, 5; C. 12; scales 2-20-5.

Body short, deep, and much compressed; back considerably elevated, the anterior profile rising in a bold curve from tip of snout to origin of dorsal fin; a slight depression on snout in front of eyes; interorbital space rather wide and high; head rather small, compressed, its greatest width 2.3 in its length; snout large and heavy; mouth moderate, little oblique, entirely below axis of body, the jaws equal; each jaw with a pair of strong, curved canines in front, and a row of shorter conic teeth on each side, these decreasing in size posteriorly; eye small, entirely above axis of body; preorbital deep; lips thick and fleshy; opercle ending in a broad, short flap; caudal peduncle very deep and thin. Scales large, thin and firm, covering body and entire head except snout, those on head thickest; lateral line beginning at upper end of gill-opening and running in a nearly straight line to scale beneath last dorsal ray, where it ceases but reappears 2 rows farther down and 3 scales farther forward, thence continuing to base of caudal; pores of lateral line not much branched. Dorsal fin beginning over base of pectoral, the spines weak and short, their length not much exceeding half length of snout; soft dorsal pointed, the longest rays 1.5 in head; a sheath of large scales at base of dorsal; caudal trilobate, the outer and middle rays produced, the longest rays about 1.4 in head; anal similar to soft dorsal, pointed, the longest rays 1.3 in head; anal spines graduated, the first very short, less than orbit, the third about 3.5 in head; pectoral broad, truncate, its length 1.9 in head; ventrals very long and pointed, reaching base of first anal ray, their length about 1.25 in head.

Color in life, olive gray; a series of greenish-blue cross-streaks, very numerous and well defined, pale cherry-red cross-shades between them; head with radiating streaks and spots of crimson; chin dull; dorsal light olive with cherry-red edge and intramarginal streak; soft rays mostly colorless; a little dusky spot at base; caudal dusky, edged all around with pale, the tip and edge mostly red; anal olive with green rays and 2 red marginal stripes; ventral with blue rays, an olive blotch and a pink edge; pectoral yellow-olive, dark olive at base.

Color in alcohol, dark brown, blotched irregularly with darker; head with numerous short, narrow pale streaks, some of them more or less wavy, those on opercles breaking up into round spots; dorsal fin greenish olive, with pale border narrowly edged with darker; caudal dark greenish; anal dark greenish, edge pale; pectoral pale; ventrals greenish-blue; iris green. Description of male (No. 04627, 10 inches long) from Pago Pago, Samoa.

A female example 6 inches long (from Pago Pago) differs from the male just described chiefly in the more slender snout, less elevated back, rounded caudal, less pointed dorsal and anal, and much shorter ventrals. The pale markings on the head are less distinct. The female and young with short ventrals correspond to *Cheilinus sinuosus* described from Sandwich Islands by Quoy and Gaimard. We have obtained many specimens of this species from Samoa, but saw none in Honolulu. The only Hawaiian record is that of Quoy and Gaimard.

Cheilinus trilobatus Lacépède, Hist. Nat. Poiss., III, 529, 537, pl. 31, fig. 3, 1801, Indian Ocean near Mauritius.

Cheilinus sinuosus Quoy & Gaimard, Voy. Uranie, Poiss., 278, 1824, Sandwich Islands; young: Rüppell, Atlas Fisch., 22, 1828; Cuvier & Valenciennes, Hist. Nat. Poiss., XIV, 79, 1839; Bleeker, Atlas, I, 66, pl. 27, fig. 2, 1862; Günther, Cat., IV, 126, 1862; Klunzinger, Fisch. Roth. Meer. in Verhand. Zool. Bot. Ges. Wien, XXI, 1871, 553.

Cheilinus rivulatus, Cuvier & Valenciennes, op. cit., 86.

Genus 163. *NOVACULICHTHYS* Bleeker.

Labroid fishes with oblong body; postocular region of head scaly; 27 or 28 scales in longitudinal series; each jaw with many series of conspicuous crystalline teeth, the 2 anterior canines curved, no angular teeth; dorsal fin and base of anal scaleless; the 2 anterior dorsal spines flexible, the following 7 pungent; anal spines 3; lateral line interrupted; lower pharyngeals with 4 or 5 series of teeth.

Novaculichthys Bleeker, Consp. Gen. Labr. in Versl. Kon. Ak. Wet. XIII, 1862, 102 (*taeniourus*); Bleeker, Proc. Zool. Soc. Lond. 1861, 410-13; Bleeker, Atlas Ichth., I, 143, 1862.

a. First 2 dorsal spines somewhat shorter than the others, never produced *woodi*, p. 323
 aa. First 2 dorsal spines not at all shorter than the others, sometimes produced.

- b. First 2 dorsal spines somewhat removed from the third, and the third and fourth somewhat farther apart than the others; in males the first 2 produced to more than twice length of third; in life general body color above dull olive brown with no dark cross-bars.....*taniorus*, p. 325
- bb. First 3 dorsal spines about equally spaced with the others; the first 2 greatly produced, more than 3 times the length of the third, and the fifth produced to about twice the length of the third; general body color green with dark cross-bands.....*kallosoma*, p. 327

257. *Novaculichthys woodi* Jenkins. Plate XL and Figs. 137 and 137a.

Head 3.25 in length; depth 3; eye 5.5 in head; snout 2.6; maxillary 3.6; interorbital 4.6; D. IX, 12; A. III, 12; scales 3-27-7-24 pores; Br. 6.

Body oblong, elliptical, greatly compressed; dorsal outline but slightly more convex than ventral; head longer than deep; snout rather short and pointed; lower jaw slightly the longer; mouth small, slightly oblique, the maxillary not reaching vertical of eye by a distance equal to pupil; each jaw with a pair of large curved canines in front and a series of smaller conic teeth on the sides; anterior profile gently and regularly curved from tip of snout to origin of dorsal; cheek moderately deep, oblique; interorbital high, convex, somewhat trenchant; dorsal fin beginning over middle of opercle, the ante-

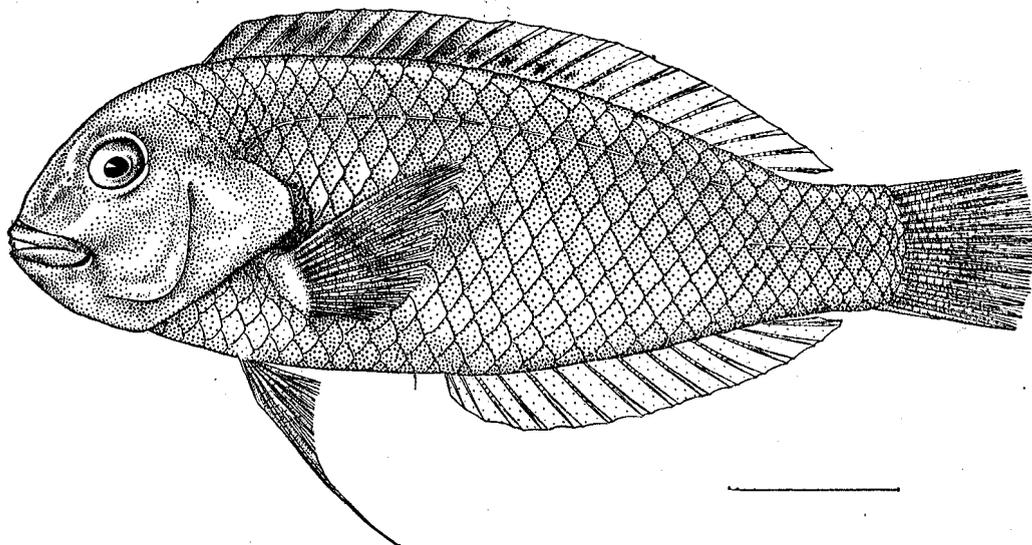


FIG. 137.—*Novaculichthys woodi* Jenkins; from the type.

rior spines not detached nor produced; spines all sharp, about equal in length, 3.6 in head; dorsal rays somewhat longer, about 2.5 in head; anal spine short and sharp; anal rays about equal to those of soft dorsal; caudal slightly rounded, its length 2 in head; ventrals with the spine sharp, a little longer than diameter of eye, the first ray filamentous, reaching somewhat beyond origin of anal, about 1.25 in head; pectoral moderate, barely reaching origin of anal, 1.5 in head; scales thin and firm; lateral line following line of back until under base of fourth dorsal ray from last, where it drops 2 rows of scales and continues to base of caudal; head entirely naked, breast nearly naked, only 2 or 3 small scales apparent. Description based chiefly upon a specimen (No. 03483) 6.6 inches long from Hilo.

Color in life, olivaceous above, rosy on nape, violaceous below, the general effect pale violet; some rosy shades on side; above pectoral yellowish white shaded with rosy; violet on lower side, gold-rosy on side and bright rosy on nape; side of head livid violet; 2 gray streaks across lower jaw, no distinct marks on head, but in fresher male specimens an ill-defined golden area behind head passing off into rosy; spinous dorsal violet-blue, with round ink-like spots of indigo-blue; soft dorsal, anal, and caudal bright salmon-red, unmarked; ventrals violet white; pectoral reddish, the axil scarlet with a violet line; some dark red dots on caudal; pores of lateral line pale orange; iris bright crimson.

Another specimen (No. 03496) obtained at Hilo, showed in life the following colors: Head and caudal peduncle below lateral line pale bluish purple; back along spinous dorsal brownish yellow overlaid with a grayish shade; a pale yellowish patch above axil of pectoral; an orange dot on each scale of lateral line, margin of scale pale brownish; nape brown with slightly reddish tinge; belly with 9 or 10 whitish vertical streaks on the peritoneum, but discernible through the skin; membranes of spinous dorsal purple, with a round, jet-black spot between each 2 spines, purple on edge; soft dorsal delicate orange-red, the base with purplish shade, small black spots similar to those on spinous dorsal on first 2 or 3 membranes of soft dorsal; caudal fin pale orange-red, the distal portion brighter; anal and pectorals same as caudal; ventrals pale purple; iris pinkish red. A nearly fresh specimen (No. 02974) was described as very pale rosy, with bluish and purplish iridescence, somewhat yellowish above pectoral; 2 rows of scales next to dorsal whitish; nape rosy; snout and cheek ashy yellowish; under parts whitish; middle of side with a wedged-shaped paler space ending in a blunt point on caudal peduncle; fins all pale rosy, except spinous dorsal, which has a small bluish-black spot on each membrane; iris pink. Still another specimen (No. 03456) was described as bluish on body with golden tinge; spinous dorsal blue with a white spot on each membrane; soft dorsal and anal rosy; ventrals rosy except produced ray, which is white; pectoral light rosy with slight dusky on upper 2 rays on proximal half; iris rosy. An examination of this same specimen after it had been in alcohol more than 2 years shows the

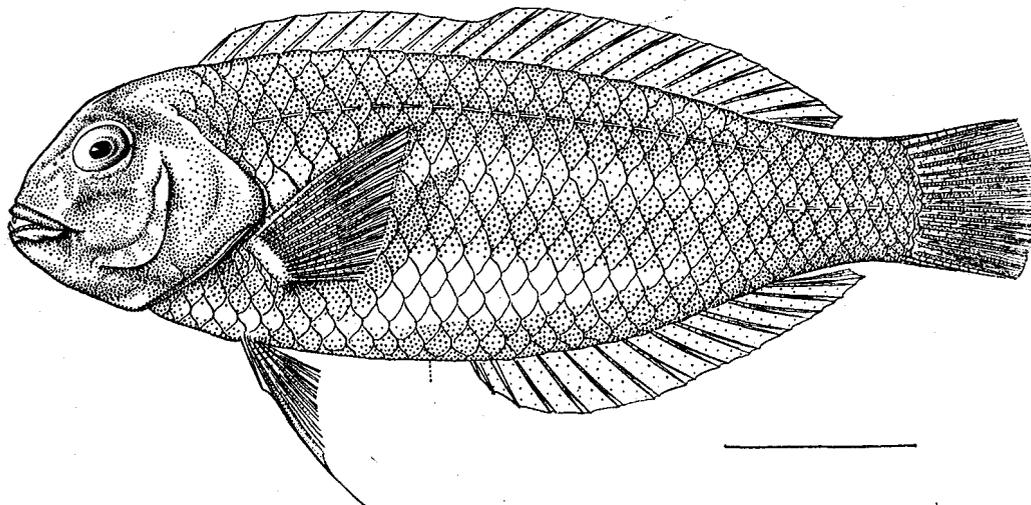


FIG. 137a.—*Novaculichthys woodi* Jenkins. Type of *N. entargyreus* Jenkins.

spinous dorsal bluish dusky with one or more rather distinct whiter spots, these continuing on the membrane of 3 or 4 rays, rest of soft dorsal and all the other fins pale yellowish white; axil dusky.

An examination of a large series of specimens, including the types of *N. woodi* and *N. entargyreus* and a careful study of Mr. Seale's photograph and description of *N. tattoo*, shows that all constitute but one species. The tattoo marks on the belly shown in Mr. Seale's photograph and described by Dr. Jenkins in his account of *N. entargyreus* show plainly in our alcoholic specimens Nos. 05757, 05434, and 05726, and the life color note taken by Mr. Sindo on specimen No. 03496 calls attention to the same markings. In the majority of our specimens, including specimen No. 03496, these "tattoo" marks do not appear externally, as Dr. Jenkins has correctly stated, being upon the peritoneum and not always showing through. Upon dissection, however, we find them present in all of the numerous specimens examined by us. Dissection also shows them to be equally plain upon the cotype of *N. woodi*.

We have examined 19 examples (3 collected by Dr. Jenkins, including the types of *N. woodi* and *N. entargyreus*), 7 from Hilo and 12 from Honolulu; these are 4.6 to 6.75 inches long. The species is rather common about the coral reefs.

Novaculichthys woodi Jenkins, Bull. U. S. Fish Comm., XIX, 1899 (Aug. 30, 1900), 52, fig. 8, Honolulu (type, No. 6029, Stanford Univ., Coll. Dr. Wood); Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 465 (Honolulu).

Novaculichthys entargyreus Jenkins, Bull. U. S. Fish Comm., XIX, 1899 (Aug. 30, 1900), 53, fig. 9, Honolulu (type, No. 5984, Stanford Univ., Coll. Dr. Wood).

Novaculichthys tattoo Seale, Occasional Papers Bishop Museum, Vol. I, No. 4, 5, fig. 2, 1901, Honolulu (type, No. 611, B. P. B. M., Coll. A. Seale).

258. *Novaculichthys tæniourus* (Lacépède). Fig. 138.

Head 3.2 in length; depth 3; eye 7.5 in head; snout 2.9; maxillary 3.4; preorbital 4.6; interorbital 5.5; D. IX, 12; A. III, 12; scales 2-26-9.

Body rather long and greatly compressed; head rather long, longer than deep; snout long, low and bluntly conic; anterior profile oblique, rising in a gently convex line from tip of snout to nape; dorsal and ventral outlines in long, low curves; caudal peduncle very deep, 2 in head; mouth rather large, nearly horizontal, the maxillary reaching anterior edge of pupil; jaws each with a pair of strong curved canines in front, and a series of small, close-set conic teeth laterally, usually a second or third pair of smaller canines toward the front; eye small, anterior, above axis of body; interorbital rather broad, convex but not trenchant; opercles smooth, their edges membranous, the opercle ending in a long broad soft flap; dorsal fin continuous, first 2 spines not detached, the membrane between them and the third not notched, these spines large but soft and flexible, not produced in the female, but markedly produced in the male, their length being more than twice that of third spine; origin of dorsal fin over vertical from upper edge of preopercle, length of second dorsal spine equaling gape; other dorsal spines somewhat stiffer and sharper, their length about equal to second; soft portion of dorsal somewhat elevated, length of longest rays 2 in head; anal similar to soft dorsal, its rays somewhat

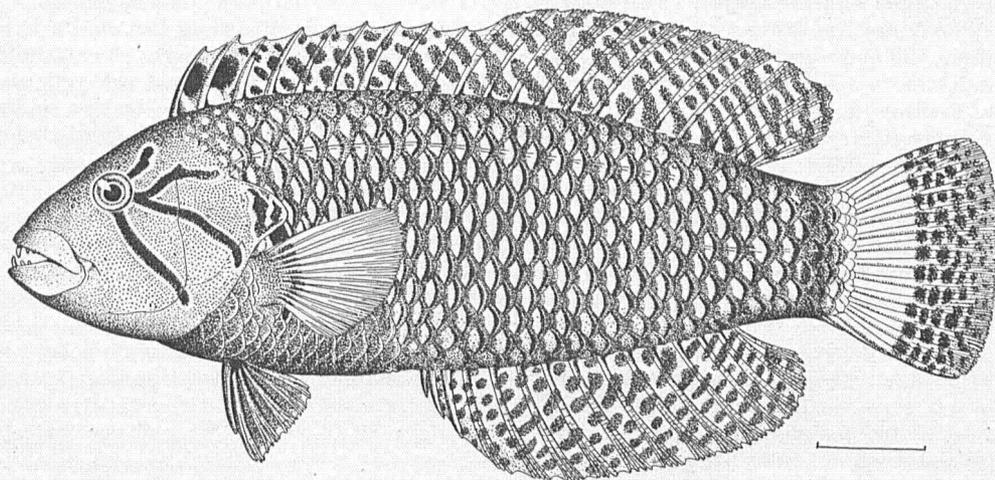


FIG. 138.—*Novaculichthys tæniourus* (Lacépède).

longer, 1.8 in head; caudal broad, slightly convex, its length 2 in head; ventrals short, not reaching vent by a distance slightly greater than diameter of eye, their length 2.4 in head; pectoral broad, its length slightly greater than half head; scales large, smooth, and thin; lateral line following second row of scales from back, until under base of third dorsal ray from last, where it drops 3 rows of scales and continues to base of caudal, there being 19 pores on the first part and 4 on the other; head entirely naked, except a few very small obscure scales back of orbit.

Color in life, from a specimen (No. 03249) from Honolulu, dull olive brown; each scale, except on belly, with a large vertical oblong spot of olive white; belly light dull red, each scale with a white edge; scales of breast plain dirty olive; head olive, darker above, reddish on lips; 4 dark olive bands radiating from eye, each edged with gray, the second and third confluent at base, the first and second short, the third reaching edge of subopercle and the fourth nearly to edge of preopercle; membranes

of first 2 dorsal spines jet-black, with a golden spot below; rest of dorsal fin with alternations of oblique bluish or grayish lines and rows of olive spots, these spots smaller and more reticulate near tip of fin; anal similar, its edge dusky; caudal dark olive, with bluish reticulations, a broad band of dirty white covering its basal two-fifths; pectoral faintly olivaceous, its inner base and a large axillary blotch jet-black; ventrals reddish black, with a black spot in the axil; iris purple.

On specimen No. 03501 there was a bright yellow spot at base of pectoral; axil black, an irregularly curved black spot behind axil, concave anteriorly. Another specimen (No. 03502) differed markedly from the preceding example, having the color in life dull slaty bluish, no orange or reddish on belly; edges of scales on belly not white; no lines radiating from eye; no other markings on head; black and yellow on first 2 dorsal membranes; the black axillary spot large and united with the curved black area at lower edge of pectoral. Another specimen, 8 inches long (No. 03393), taken July 8, was blackish olive, nearly uniform, the scales of side with a pale olive-gray vertical bar; axil jet-black, with a jet-black ocellus above, and bright yellow on base of first pectoral ray; head mottled olive, unmarked; dorsal dingy olive, with a large black ocellus behind second spine; soft dorsal vaguely cross-spotted with dull bluish and dull golden-olive, its edge washed with red; anal mottled olive, edged with blackish; caudal reddish olive, with a dull pink or flesh-colored crossbar, a dusky bar behind; ventrals mottled black; pectoral dusky, its first ray reddish.

The same specimen in alcohol has the scales pale or dusky white, somewhat rosy, with broad dark brown borders; axil of pectoral black, with a large bluish-black blotch above and a narrow blue-black line below; membrane between first and second dorsal spines black, that between second and third spines with a black spot below, which is a light, yellowish area, rest of dorsal fin pale yellowish white, crossed by numerous series of irregular large brownish-purple spots, these coalescing more or less posteriorly; edge of soft dorsal more or less purplish; anal similar to soft dorsal, markings less distinct, edge darker; caudal with a broad yellowish white bar on its basal two-fifths, the outer portion dusky olivaceous crossed by obscure vertical paler lines; 1 or 2 scales on lateral line beneath first to third dorsal rays, sometimes with a blackish spot; head pale yellowish white, a narrow dark line from eye downward and backward to near edge of preopercle; a similar bar from posterior border of eye downward and backward toward edge of opercle, slightly below upper edge of pectoral; a third much shorter line from posterior border of eye, where it sometimes coalesces with the second, upward and backward toward origin of lateral line; and a fourth, shorter and less distinct, upward and backward from upper edge of orbit toward nape. In some specimens, particularly the males, there are 2 narrow lines across interorbital space from eye to eye, 2 similar ones downward from eye toward end of maxillary, and a fainter one forward from eye under nostril. In some specimens, particularly the larger ones, the general color is darker and the oblong black pectoral ocellus is more distinct.

The above description, except life-color notes, based upon (No. 05611) a specimen 10 inches long from Honolulu. This species appears to be not uncommon at times among the Hawaiian Islands. There was 1 specimen from Honolulu in the collection examined by Steindachner. It was not obtained by Dr. Jenkins, but 2 specimens were obtained by Dr. Wood in 1898, and one male by Jordan and Snyder in 1900. Abundant in Samoa.

The young of this species have the first 2 dorsal spines elongate and more or less detached, as usual in *Novaculichthys*. Our collection contains 21 excellent specimens, only 3 of which are males. Two examples were collected at Honolulu by Dr. Wood and 2 by Jordan and Snyder; of our specimens only 2 are from Hilo. Length, 5.4 to 10.2 inches.

Labrus tentourus Lacépède Hist. Nat. Poiss., III, 448, 518, 1801, Tropical Pacific.

Sparus hemisphaerium Lacépède, op. cit., IV, 53, 160, 1802, locality not given.

Sparus brachion Lacépède, op. cit., 54, 160, 1802, locality not given.

Julis vanikorensis Quoy & Gaimard, Voy. Astrolabe, Poiss., 704, pl. 20, fig. 1, 1833, Vanikoro.

Julis bifer (young) Lay & Bennett, Zool. Becchey's Voyage, 64, 1839, Oahu Island.

Novacula cephalotenia Bleeker, Nat. Tijds. Ned. Ind., VI, 1854, 333, Lurantuka.

Novacula haadtii (young) Bleeker, Act. Soc. Sc. Ind. Neerl. 1, 1856, Vissch. Amboina, 59, Amboyna.

Novacula vanicolensis, Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 504 (Honolulu).

Novaculichthys hemisphaerium, Jenkins, Bull. U. S. Fish Com., XXII, 1902 (Sept. 23, 1903), 464 (Honolulu).

Novaculichthys tentourus, Snyder, op. cit. (Jan. 19, 1904), 530 (Honolulu).

259. *Novaculichthys kallosoma* (Bleeker). Plate XLI.

Head measured to end of opercular flap 3 in length; depth 3; depth of caudal peduncle 6; snout 3.3 in head; eye 5; dorsal IX, 12; anal III, 12; scales 2-26-9. Color in life green, spotted with white and banded with black.

Width of body 2.7 in head; snout not pointed, the profile convex from tip of snout to occiput; interorbital area acutely rounded or angular, the distance between the eyes equal to their diameter; maxillary extending to a vertical passing through anterior edge of pupil; each jaw with a pair of canine teeth at the symphysis, the lower pair fitting between the upper teeth; head naked, except a small space behind and below orbit, where there are 2 rows of minute scales, which do not extend around the orbit but occupy only a space equal in length to diameter of eye, the center of the scaled area being on a line between pupil and upper edge of base of pectoral; lateral line interrupted on the twentieth scale, beginning again on the third scale below and extending to base of caudal; first and second spines of dorsal greatly lengthened and very flexible, the first equal to the length of head, the second 2.4 in length, these spines connected with each other and with the following ones, the membrane between the first and second about equal in height to the eighth spine, that between the second and third deeply scolloped; each spine with a narrow strip of membrane along the posterior edge of the free part, the fifth longest of the remaining spines, its length 2.2 in head; longest ray 1.6 in head; anal spines slender, graduated in length from first to third, the second 4.5 in head; longest ray 1.7; caudal rounded, its length 1.2 in head; pectoral extending to a point above origin of anal; second ray of ventral elongate; when depressed, reaching anal opening.

Color in alcohol, yellowish white; head with 9 black lines radiating from eye; an elongate white spot on chin extending downward from corner of mouth, another on cheek below eye near angle of preopercle, and a third below the latter in the branchiostegal region; body with 5 narrow dusky bands, the first extending from origin of dorsal downward and backward across edge of opercular flap and base of pectoral to base of ventral; the second passing downward from base of sixth dorsal spine, widening and disappearing in region of pectoral; the third extending between the third dorsal and the third anal rays; the fourth between the eighth dorsal and eighth anal rays; the fifth, shaped like a chevron, the point forward, is on the caudal peduncle; first and second spines with broad, dusky bars, the fin with large dusky clouds, prolongations of the dark body bands; between the large spots are smaller ones corresponding with vertical rows of irregular spots on the body; anal colored like the dorsal; distal half of caudal rays dusky; pectoral white; ventrals dusky, the inner half of fin bordered with white.

Described from a single specimen, 4.5 inches long, obtained by the *Albatross* at Honolulu, which agrees with a specimen, bright green in life, collected by Dr. Jordan at Pago Pago, and with another from the Island of Negros, P. I.

Since the above was written we have received from Mr. Berndt a second specimen, from Honolulu, which is grass-green in color. Our plate is from the Pago Pago specimen, by Dr. Jordan, revised by Kako Morita.

Novacula kallosoma Bleeker, Visch. Amboyna, 5, in Act. Soc. Sc. Indo. Neerl. VIII, Amboyna.

Novaculichthys kallosoma, Bleeker, Synon. Labr. in Versl. Kon. Ak. Wet., XIII, 1862, 293 (Amboyna); Atlas Icth. I, 145, 1862, tab. 31, fig. 3; Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 530 (Honolulu).

Genus 164. *CYMOLUTES* Günther.

Body compressed, oblong, covered with small scales; snout rather elevated; head naked; lateral line interrupted; no posterior canine tooth; D. IX, 12-14; A. III, 12-14.

Cymolutes Günther, Ann. Mag. Nat. Hist., VIII, 1861, 387 (*pratetatus*).

260. *Cymolutes lecluse* (Quoy & Gaimard).

Head 3.35 in length; depth 3.65; eye 5.65 in head; snout 2; gape 4; interorbital 5.1; D. IX, 13; A. III, 13; scales 7-79-23.

Body fusiform or wedge-shaped, tapering gradually from nape to caudal; head short; snout long but decurved, the anterior profile in a regular bold curve from tip of snout to nape; mouth low, horizontal, the gape not nearly reaching vertical of eye; each jaw with a pair of strong canines in front and a series of smaller conic teeth laterally, inside of which are shorter, bluntly conic teeth; eyes high up,

near the dorsal line and close together; cheek very deep; opercles with their edges smooth; opercle with a broad, flexible flap; caudal peduncle moderately deep, 2.8 in head; scales small, densely covering entire body, except a narrow naked area on breast and nape; head naked, but with a small patch of 6 or 8 scales below the eye; lateral line running high, following contour of back until under fifth dorsal spine from last, where it closes, reappearing again 5 scales below and continuing to base of caudal fin, sometimes the last pore of first part bent down and the first of the last part bent upward; dorsal fin beginning over middle of opercle, the spines soft and flexible, their length about 4.4 in head, dorsal rays scarcely longer; anal spine and rays similar to those of dorsal; caudal truncate; outer rays of ventrals slightly produced, their length 2 in head; pectoral rather short and broad, about 1.75 in head.

Color in life of a nearly fresh specimen (No. 03153) pale rosy white, with some yellowish; top of head pale greenish; anterior pectoral region greenish; a small jet-black ocellated spot, with pale blue border on upper part of side under about eighth dorsal spine; dorsal pale greenish, edged with pale orange and blue, a narrow black line near tip of first membrane; caudal pale yellowish white; pectoral and ventrals whitish; anal white; iris yellow surrounded by rosy.

Another specimen (No. 03408) had the belly pale bluish white, the general color of body very pale olive-green; anal colorless; dorsal colorless except for a narrow pale red edge; a yellow ocher spot on opercular flap; a small dark spot on upper posterior part of the caudal peduncle; caudal colorless, the anterior half tinged with pale yellow; other fins colorless; iris bright yellow surrounded by a rim of lake-purple, a stripe along back for entire length, just above lateral line slightly paler and more nearly color of belly. A live example (No. 03458), taken at Honolulu, July 27, had the general color bluish white; edge of gill-opening and posterior part of opercle pale pinkish yellow; a quadrate area from gill-opening to vent and from ventral line of belly to level of lower border of eye pure white; an indistinct irregular band of pale pinkish yellow from below eye backward along upper border of the quadrate white area; posterior half of side with about 13 transverse pale pinkish bars; a small round black spot, with bright greenish blue border on side above tip of pectoral and just below lateral line; anterior part of dorsal fin with a Y-shaped black line with greenish border; posterior part bordered with pale pinkish yellow.

Color in alcohol, very pale yellowish or brownish white; side from above base of pectoral to vertical of origin of anal with a broad yellowish white area, the small black spot on side unchanged, as is likewise the black on first dorsal membrane; black spot on side rarely absent and sometimes double; occasionally an indistinct black spot on each side of upper posterior end of caudal peduncle.

The above general description is based chiefly upon a specimen (No. 03153) obtained at Honolulu. This species reaches a length of 6 or 7 inches and is fairly abundant at Honolulu. We have examined 26 specimens (4.8 to 6.25 inches long), 1 from Hilo, the others from Honolulu.

Xyrichtys tecluse Quoy & Gaimard, Voy. Uranie, Zool., 284, pl. 65, fig. 1, 1824, Hawaii.

Xyrichtys microlepidotus Cuvier & Valenciennes, Hist. Nat. Poiss., XIV, 52, 1839, Owhyhee (Hawaii) (Coll. Quoy & Gaimard).

Cymolutes teclusei, Günther, Cat., IV, 207, 1862 (Hawaiian Islands).

Cymolutes tecluse, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 465 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 531 (Honolulu).

Genus 165. *INIISTIUS* Gill.

Body compressed, oblong, covered with large thin scales, about 26 in the lateral line; head scaleless or nearly so; head short and deep, the upper and anterior outline compressed to a sharp edge; profile almost vertical; eye small, placed high; D. II-VII, 12; A. III, 12; first 2 dorsal spines detached from the others and inserted on or close behind the occiput; lateral line interrupted, extending on the second row of large scales below the dorsal sheath; canines, 2 in front of each jaw; no posterior canines.

This genus contains some 5 or 6 species, chiefly of the western Pacific. They are similar in most respects to the species of *Xyrichtys*, differing principally in having the 2 anterior spines of the dorsal fin produced, separated from the others, and placed as a separate fin on the nape.

Iniistius Gill, Proc. Ac. Nat. Sci. Phila. 1862, 143 (*pavo*).

a. Body-color in life olive green or gray, not black or brown; 3 more or less distinct cross-shades.....*pavoninus*, p. 329
aa. Body-color in life black or brown; no crossbars.....*niger*, p. 331

261. *Iniistius pavoninus* (Cuvier & Valenciennes). Plate XLII and Fig. 139.

Head 3 in length; depth 2.5; eye 6.5 in head; snout 2; maxillary 3.4; preorbital 2.3; interorbital 5; D. II-VII, 12; A. III, 12; scales 3-27-9.

Body short, deep, and greatly compressed; head deeper than long; caudal peduncle very short and deep, its length 3 in head, its depth 2.2; snout very short and blunt, the anterior profile almost vertical from tip of jaws to front of eyes, thence in a sharp curve to origin of dorsal, from which line the dorsal and ventral outlines are about equally curved to caudal peduncle; snout and anterior profile very trenchant; mouth small, nearly horizontal, the maxillary reaching vertical of anterior edge of orbit; mandible strong, the lower edge compressed and convex; a pair of strong curved canines on front of each jaw, back of which are smaller teeth; each side of jaw with short conic teeth; preorbital nearly vertical and very deep; interorbital high, very convex and very trenchant; preopercle and opercle smooth, their edges thin and flexible; anterior 2 spines of dorsal detached, placed upon occiput over posterior line of orbit, the first spine produced and filamentous, its length 1.9 in head, both spines very soft and flexible, other dorsal spines rather short and flexible, their length less than gape of

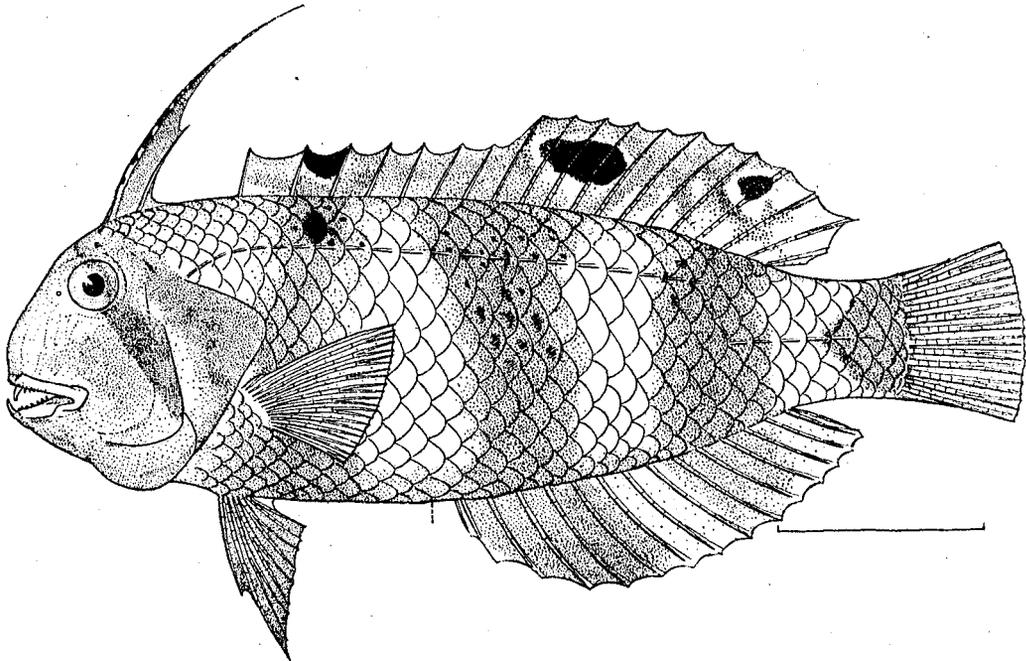


FIG. 139.—*Iniistius pavoninus* (Cuvier & Valenciennes). Type of *I. leucozonus* Jenkins. The first anal ray in figure should be a spine.

mouth; dorsal rays somewhat longer, 3.2 in head; anal similar to soft dorsal, the rays of about equal length, about 2.6 in head; ventrals with outer ray produced, nearly reaching origin of anal, their length 1.6 in head; pectoral short, reaching a vertical at vent, the length 1.7 in head; scales large, smooth, thin, and adherent, those on breast slightly reduced; head naked, except sometimes a few small scales below eye; lateral line ascending for 3 scales, then continuing approximately straight to scale under last anal ray but 2, where it drops 3 rows and continues on 5 scales to base of caudal.

Color in life of a male (No. 03484) 14 inches long, olive green, with 3 dark cross-shades narrower than the interspaces; first band with each scale below level of eye edged with bright blue, a black crescent above, edged in front with light blue; in second band most of the scales below level of eye edged with bright blue, 3 of them with black; in the third band some scales edged with pale blue; first interspace with a quadrate spot of golden white; middle line of forehead, chin, and throat violet, this color varying in shade and edged on each side with light orange; an oblique band on cheek and whole opercular region golden olive, with oblique violet lines and dots; first dorsal dull violet; second

dorsal dull olive, with lines and spots of violet blue, greenish blue distally; caudal dull olive, with intramarginal band of sky blue; ventral pale, axil blackish violet; pectoral largely blackish; anal dull olive, with bluish marks and an intramarginal sky-blue band; iris crimson.

Examples from Hilo had the pale lateral spot generally white tinged with golden, sometimes pure white, sometimes pure rosy; some have an additional black spot edged with blue above front of anal. A female has the same cross-bands, the first black spot similar, the white area shaded with both yellowish and violet, the marks in the second band wanting, the least trace of markings on head anteriorly, and on side; fin markings similar, but all faint; iris dull crimson; intramarginal band on caudal distinctly pale blue.

Two other specimens (Nos. 03000 and 03001) were described in life as pale olive gray, whitening on side and belly; side with 4 broad darker bars, the first at base of pectoral, second between anterior end of anal and middle of dorsal, third between posterior ends of dorsal and anal, and the fourth at base of caudal fin, the third darkest; a black spot covering 1 scale under membrane between fourth and fifth dorsal spine; this bordered, except behind, with blue; first and second series of scales below dorsal with narrow blue lines; dorsals grayish, with numerous blue lines extending upward and forward, these separated by broader grayish brown lines; anal white with a narrow blue line near its border, tipped with brown; caudal whitish, dark at tip; pectoral olive gray above, pale yellowish below; ventrals white; iris pink. Another specimen (No. 03025) was described as pale dusky white; opercle with 2 darker bands, one downward from eye to subopercle, the other across opercle, each with some purple; side with a broad vertical dusky bar upward from front of anal, and 2 less distinct ones farther back; edges of some scales pale yellow; a small black spot, bordered anteriorly with blue, on second row of scales below fourth dorsal spine; dorsal pale bluish, crossed by numerous brownish orange bars; caudal white, with 2 or 3 narrow faint yellow cross-bands, the tip black; pectoral white, slightly dusky at base; 2 pale rosy blotches on belly at base of anal; ventrals white; iris purple.

Color in alcohol (No. 03534) pale, somewhat dusky; body crossed by 4 broad brownish vertical bars, the first under proximal half of pectoral, the second upward from anterior anal rays, the third between last dorsal and anal rays, fourth on distal half of caudal peduncle; humeral region, interspaces between dark bars, lower parts of head and belly yellowish white, the space between lower half of first and second dark bars most distinctly white; one scale above lateral line and under base of fourth dorsal spine black, bordered on its base by light blue; dorsals dusky, almost black on edge, the membranes vermiculated with dark and light; caudal smoky, the edge darker; anal dirty yellowish, the edge with a narrow olivaceous border; ventrals pale; pectoral dusky, black within.

A young example from Hilo when fresh was violet olive, without red; 4 dark areas or bands, with pale interspaces, that behind pectoral white; base of each scale light golden, its edge violet; indigo black ocellus, edged before with violet blue; scales all over body showing shades of violet and golden, faint; first dorsal dusky bluish; second dorsal violet and golden in oblique streaks; one blue-black ocellus on dorsal edged with blue; caudal and anal faintly violaceous, the latter with a light violet border and golden edge; pectoral yellowish; ventrals dusky, edged with yellowish and violaceous; eye with faint radiating streaks of violet and golden.

Smaller specimens in alcohol are considerably lighter; ridge of snout and nape bluish, cheek and opercles brownish, with narrow wavy darker brown and bluish lines; dorsal fin paler, with wavy purplish or bluish lines extending upward and forward, the margin somewhat dusky. In many of the smaller examples the black scale on the side is without the bluish anterior border. In some small specimens, one or more scales toward the lower end of the second dark bar are darker, forming a more or less distinct brown blotch; an occasional specimen is found with an extra black spot on side above lateral line.

This species is the largest one of the genus found among the Hawaiian Islands and is one of the most important, being a valued food-fish.

These specimens are certainly *Xyrichthys pavoninus* Cuvier & Valenciennes, as were also the specimens from Honolulu identified by Steindachner with *Xyrichthys pavo* Cuvier & Valenciennes. It is very doubtful whether the latter species is found among the Hawaiian Islands. The color assigned to it by Cuvier and Valenciennes and by Bleeker does not apply to any of the numerous specimens examined by us. The species described from Cape San Lucas by Dr. Gill as *Iniistius mundicarpus* is evidently identical with this species. We have examined a total of 64 specimens, 56 from Honolulu, 7 from Hilo, and 1 from Kailua. The *Albatross* secured some also at Puako Bay.

Xyrichtys pavoninus Cuvier & Valenciennes, Hist. Nat. Poiss., XIV, 63, 1839, Sandwich Islands. (From a drawing by Webber, the artist of Cook's third voyage.)

† *Iniistius mundicorpus* Gill, Proc. Ac. Nat. Sci. Phila. 1862, 145, Cape San Lucas (coll. John Xantus); Jordan & Evermann, Fishes North & Mid. Amer., II, 1620, 1898.

Novacula (Iniistius) pavo, Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 505 (Honolulu); not of Cuvier & Valenciennes, nor of Bleeker.

Novacula pavo, Günther, Cat., IV, 175, 1862 (Sandwich Islands).

Novacula (Iniistius) tetrazona, Steindachner, op. cit.; not of Bleeker.

Iniistius leucozonus Jenkins, Bull. U. S. Fish Comm., XIX, 1899 (Aug. 30, 1900), 54, fig. 11, Honolulu, young. (Type, No. 6137 Stanford Univ., coll. O. P. Jenkins); Jenkins, op. cit. (Sept. 23, 1893), 465 (Honolulu).

Iniistius pavoninus, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903) 465 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 531 (Honolulu; Puako Bay, Hawaii).

262. *Iniistius niger* (Steindachner). Fig. 140.

Head 2.8 in length; depth 2.5; eye 6 in head; snout 2; maxillary 3.3; preorbital 2.65; interorbital 6; D. II-VII, 12; A. III, 12; scales 3-28-10.

Body short, deep and greatly compressed; head as deep as long; snout very blunt, anterior profile rising nearly vertically from tip to front of eye; dorsal and ventral outlines each in a long, low curve;

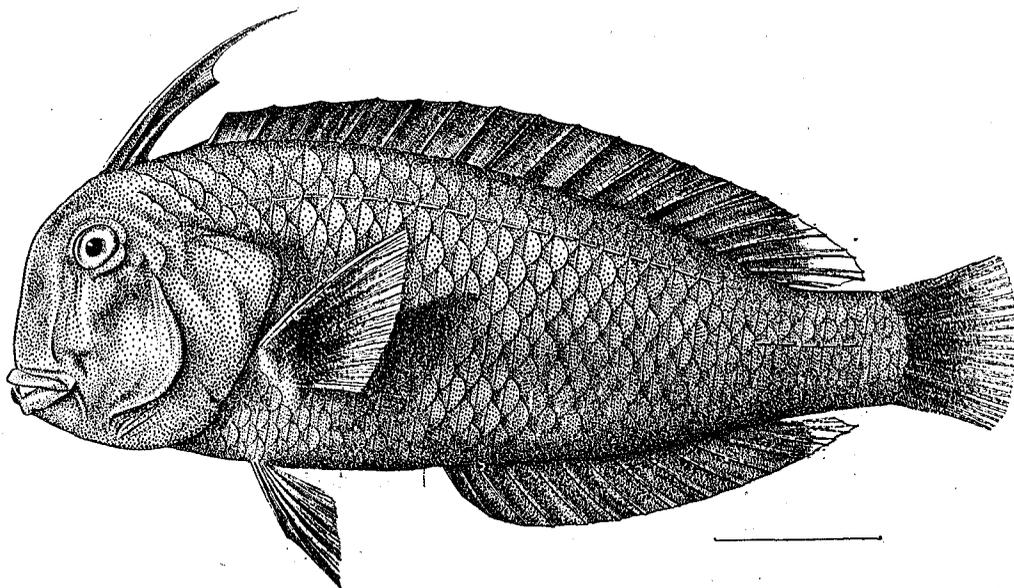


FIG. 140.—*Iniistius niger* (Steindachner). Type of *I. verater* Jenkins.

caudal peduncle compressed very deep, depth 2.3 in head; preorbital very deep, nearly vertical; mouth small, nearly horizontal, the maxillary nearly reaching vertical of anterior edge of orbit, jaws each with a pair of long curved canines anteriorly, and a series of small bluntly conic teeth, laterally; eye small, very high; interorbital space high and strongly cultrate; first 2 dorsal spines remote and entirely detached from remainder of fin, placed upon occiput above posterior half of eye, the spines soft, flexible and much produced, the length of the first equaling distance from tip of snout to edge of preopercle, second shorter by a distance equal to gape of mouth, remaining dorsal spines slender and flexible, their length about 2.7 in head; dorsal rays slightly longer, about 2.5 in head; anal similar to soft dorsal, the rays about equally long; caudal gently rounded, the rays about 2.25 in head; outer rays of ventrals produced, reaching vent 1.7 in head; pectoral broad, its length 2 in head; scales large, thin, smooth, and adherent, those on breast somewhat reduced in size; lateral line rising 3 scales from upper end of gill-opening, thence continued along second row of scales to the scale beneath last dorsal ray but one, where it drops 3 rows to middle of side, continuing on 5 scales to base of caudal; head entirely naked, excepting 1 or 2 small postocular scales.

Color in life (No. 03422) head and body nearly uniform black, underlaid by purplish on belly; caudal black, the outer third white with rosy tinge; pectoral black at base, the outer two-thirds transparent; ventrals black, with some purple; soft dorsal and anal nearly uniform black, the last rays of each usually but not always tipped with white; no humeral spot.

Another specimen (No. 03423) was very dark brown; a black scale with blue border just above lateral line and under fourth dorsal spine; belly showing some reddish purple; soft dorsal and anal with minute spots and reticulations of dark blue, similar spots on caudal; ventrals dusky red, with blue markings, detached dorsal with olive and blue; sides of face with tinges of olive over the dark background; pectoral pale on upper margin; indistinct dark olive area on body under and behind last third of pectoral; tip of soft dorsal, anal and tip of caudal not pale; iris purple.

An example (No. 02940) 2 days in alcohol had the head and body uniform black throughout; dorsal jet-black, narrowly tipped with white, the exposed tips of spines white; caudal with a broad whitish tip. Another specimen (No. 03457) had the body and head and fins quite black without other marking of any kind; the light colored extremity of caudal was rosy toward the posterior border, and the light tips of dorsal and anal showed some rosy tinge with a narrow bit of blue in the dorsal tip.

Color in alcohol, head and body uniform dark brownish black; distal third of caudal, tips of dorsal and anal and most of pectoral plain yellowish white, the pectoral a little dusky, rest of fins rich blue-black.

This species is thus far known only from Honolulu, and does not appear to be very abundant. It was not obtained by Jenkins in 1889, the 2 specimens described by him having been obtained by Wood in 1899.

Through an error, the figure given by Jenkins shows 10 dorsal spines instead of 7, as given in the text. The figure given by Steindachner is also defective, showing only 6 instead of 7 dorsal spines, and having the detached dorsal spines very much too short.

We have 19 specimens, including the type of *I. verater*, ranging from 4.8 to 8 inches long.

Novacula (Iniistius) nigra Steindachner, Anzeiger für Denks. Ak. Wiss. Wien, 1900, No. XVI, 176 (June 27, 1900), Honolulu; Denks. Ak. Wiss. Wien, LXX, 1900, 505, pl. IV, fig. 2, Honolulu; the type.

Iniistius verater Jenkins, Bull. U. S. Fish Comm., XIX, 1899 (Aug. 30, 1900), 55, fig. 12, Honolulu. (Type, No. 5990, Stanford Univ., coll. Dr. Wood).

Iniistius niger, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 465 (Honolulu)

Genus 166. HEMIPTERONOTUS Bleeker.

Body compressed, oblong, covered with scales of moderate size; head compressed, more or less elevated and obtuse, with the upper profile generally more or less parabolic; cheek with small scales; lateral line interrupted; no posterior canine tooth; D. II-VII, 12; A. III, 12, the 2 anterior dorsal spines separate from the others.

Hemipteronotus Lacépède, Hist. Nat. Poiss., III, 215, 1801 (*quinquemaculatus*).

Hemipteronotus Bleeker, Proc. Zool. Soc. Lond. 1861, 414 (*Hemipteronotus quinquemaculatus*); Bleeker, Versl. Kon. Ak. Wet., XIII, 1862, 103 (*quinquemaculatus*).

- a. No large dark area on the side, a narrow bluish band from lower anterior portion of eye running downward to behind corner of mouth, parallel with the other vertical lines from the eye and upper part of the head.....*copei*, p. 332
- aa. A large dark area on the side several scales wide and high.
- b. Anal without distinct markings.....*unbrilatus*, p. 333
- bb. Anal with oblique color bars, with black spots only in the male.
- c. Last rays of dorsal and intermembranes with large black spot.....*baldwini*, p. 334
- cc. Last rays and membrane without black spot.....*jenkinsi*, p. 336

263. *Hemipteronotus copei* Fowler.

Head 3.85 in length; depth 3; eye 6.25 in head, equal to interorbital; D. II-VII, 12; A. III, 12; scales 26 in lateral line.

Body elongate, much compressed, deepest in the pectoral region; head elevated, compressed, the anterior profile very parabolic, though slightly convex; snout not produced; eye small, high, 3 in space between its anterior margin and tip of upper jaw; interorbital convex; mouth narrow; teeth strong, the outer lateral teeth larger than the others, except the canines, which are in 2 pairs on the anterior portions of the jaw, those in lower closer together than those of upper jaw and fitting in

between the latter when the mouth is closed; gillrakers moderate; pseudobranchiae developed; head naked except a series of 6 scales, which descends obliquely forward from the postorbital though not to center of eye in the vertical, and 2 scales on upper margin of opercle; origin of dorsal slightly posterior to median vertical keel of preopercle, the first 2 dorsal spines sharp, tip of first ending in a short filament, and about the same height as spines which succeeded them, the latter being rather strong, firm, and not sharp; dorsal rays longer than the spines, the last ray, when depressed, reaching base of caudal; caudal rounded; anal similar to dorsal, its origin under the first dorsal ray, third anal spine longest; pectoral 1.75 in head, its origin below center of body and above origin of ventral; innermost ventral ray joined to body by a membrane; tips of fins not reaching origin of anal, but extending beyond tip of pectoral; lateral line concurrent with back, interrupted at the 21st scale.

General color dull brownish, the fins immaculate; a narrow bluish band from lower anterior portion of eye running downward to behind corner of mouth, parallel with this other vertical lines running from eye to upper part of head, the one on preopercle broad; the opercles with narrow lines on their posterior portion.

Oahu Island. This species is known to us only from Mr. Fowler's description.

Hemipteronotus copei Fowler, Proc. Ac. Nat. Sci. Phila. 1900 (Nov. 6, 1900), 508, pl. XX, fig. I, Oahu.

264. *Hemipteronotus umbrilatus* Jenkins. Fig. 141.

Head 3.3 in length; depth 2.8; eye 5.1 in head; snout 2; maxillary 3.5; preorbital 2.7; interorbital 5; D. II-VII, 12; A. III, 12; scales 3-27-9.

Body short, deep, greatly compressed; head as deep as long; snout very blunt, the anterior profile rising nearly vertically from tip of snout to front of eye, where it makes a sharp curve to nape; body

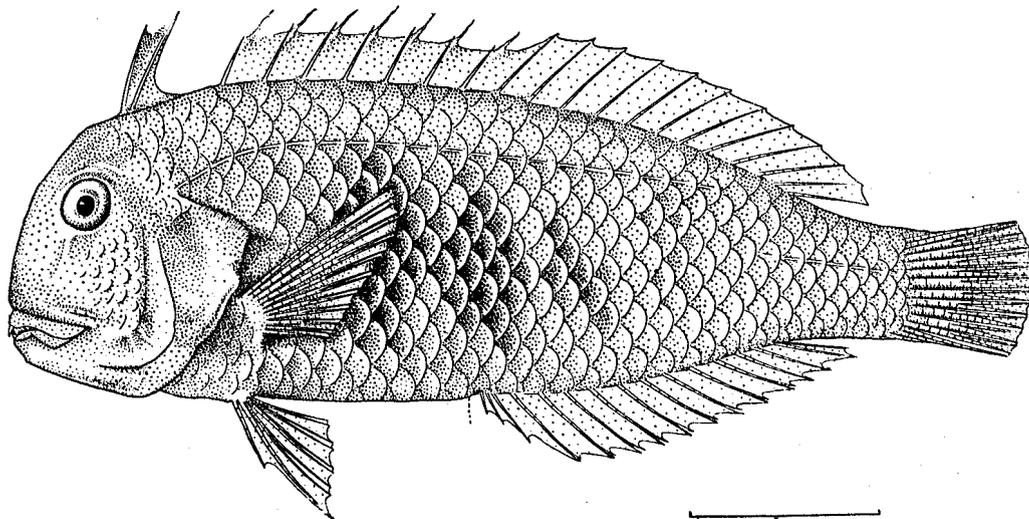


FIG. 141.—*Hemipteronotus umbrilatus* Jenkins: from the type.

deepest at base of ventrals, thence tapering gradually to caudal peduncle; mouth horizontal, the jaws equal, maxillary not reaching vertical of anterior edge of orbit; small conic teeth on sides of jaws, a pair of enlarged canines in each in front; preorbital nearly vertical and very deep; eye small, high up; preopercle smooth, opercle ending in a broad soft flap; caudal peduncle deep, its least depth 2 in head; origin of dorsal slightly behind posterior border of orbit; first 2 dorsal spines remote from but connected by low notched membrane with third spine, the detached spines soft and flexible, little produced, their length equaling gape; remaining dorsal spines low, about equaling length of detached portion; dorsal rays subequal, a little longer than spines, 2.75 in head; anal similar to soft dorsal, its origin under base of fourth dorsal ray; caudal short, slightly convex, length 2 in head; outer ray of ventral somewhat produced, not reaching ver., its length 1.75 in head; pectoral somewhat longer than ventrals, reaching vent, its length 1.4 in head; scales large, thin, and firm, those on breast some-

what smaller than those on side; cheek with about 6 vertical rows of somewhat smaller scales, 2 scales on upper end of opercle, rest of head naked; lateral line beginning at upper end of gill-opening, curving upward for 4 pores, thence following contour of back, until under base of last dorsal ray, where it drops down for 2 scales and continues to base of caudal.

Color in life, light drab, the posterior portion of each scale white or whitish; a large dark-brown blotch as large as head on middle portion of body, in which the posterior half of each scale is white; first 2 dorsal spines dusky, no distinct markings on fins.

Another specimen (No. 03027) was white, centers of scales anteriorly dusky, a large black blotch on side above tip of pectoral, covering 23 to 25 scales; preocular part of head yellowish black; dorsal, anal, and ventrals white; caudal dusky white; pectoral white with slight yellowish shade. One specimen (No. 03447) when fresh dead, was gray with bluish tinge on body and fins; small black spot on tip of anterior dorsal; large black area on side of body 7 scales wide and about 7 scales deep; below this an area of scales bluish with white margins, this extending a little farther backward than the black area.

This species is sometimes very dark, almost black, as is shown by 3 specimens from Hilo, one of which (No. 03478) was in life dirty olive, paler mesially, the head livid dusky, the anterior part of body to tip of pectoral black; fins all mottled blackish, no markings; very faint paler lines below, and a very faint shade of olive in places; no real markings, save the black anterior half of body. A smaller specimen, probably a male, had lower half of black area to front of anal deep violet blue.

Color in alcohol, yellowish white, head, nape, and breast with bluish rosy wash; middle of side with a large brownish-black blotch, about 6 scales in length and 9 in depth, the distal portion of each scale whitish; detached dorsal spines dark, rest of dorsal and anal pale, purplish and orange at base; caudal dirty whitish distally, purplish at base; pectoral and ventrals pale yellowish white; eye with a silvery ring around pupil, surrounded by light brassy, annexed by purplish blue.

This species is known only from the type and 15 other specimens obtained at Hilo and Honolulu; these are 4.75 to 8.75 inches in length.

Hemipteronotus umbrilatus Jenkins, Bull. U. S. Fish Comm., XIX, 1899 (Aug. 30, 1900), 53, fig. 10, Honolulu (type, No. 6135, Stanford Univ. Coll. Dr. Jenkins); Jenkins, op. cit. XXII, 1902 (Sept. 23, 1903), 464 (Honolulu).

265. *Hemipteronotus baldwini* Jordan & Evermann. Plate XXXIX.

Head 3.25 in length; depth 3; eye 5.75 in head; snout 1.75; maxillary 3; preorbital 2.2; interorbital 4.8; D. II-VIII, 13; A. III, 13; scales 3-27-9.

Body moderately short and deep, greatly compressed; head slightly deeper than long; anterior profile nearly vertical from mouth to front of eye, sharply cultrate; dorsal outline gently convex, sloping, to the deep caudal peduncle; ventral outline less convex; caudal peduncle very narrow, the depth 2.25 in head; mouth small, horizontal, the maxillary nearly reaching vertical of orbit; the jaws equal, each provided anteriorly with a pair of strong curved canines and laterally with a single row of short close-set conic teeth; lower jaw strong, its outline very convex; preorbital nearly vertical and very deep; preopercle and opercle smooth, with membranous edges, the latter produced somewhat in a broad rounded flap; origin of dorsal but little posterior to orbit, far in advance of base of ventrals; first 2 dorsal spines somewhat removed from third but connected to it by a low membrane, their length scarcely greater than the gape of mouth; remaining dorsal spines short and weak, scarcely equaling gape; soft dorsal low, the rays slightly longer than the spines; anal similar to soft dorsal, rays somewhat longer; caudal slightly convex, rays 2 in head; outer ray of each ventral somewhat produced, not reaching vent, the length about 1.9 in head; pectoral broad, the longest rays 1.7 in head; scales large, thin, smooth, firmly attached, those on breast somewhat reduced; head naked, except about 4 series of small scales extending from eye downward to level of mouth; lateral line curving abruptly upward from upper end of gill-opening, following contour of back to the scale under third dorsal ray from last, where it drops 3 rows and continues to base of caudal, the pores simple, unbranched.

Description based upon the type, No. 50644, U. S. Nat. Mus. (field No. 03414), a male example, 8.5 inches long, obtained at Honolulu.

Color in life (field No. 03123) pale, yellowish white over head and body; a diffuse lemon-yellow blotch under and above pectoral; a large brownish-black blotch on lateral line under seventh to tenth dorsal spines; dorsal fin yellowish-white, tip of detached part with a jet-black crescent (this marking variable in position, sometimes being farther posterior), rest of fin faintly mottled with yellowish

and olive, the latter in narrow oblique lines; caudal yellowish white; anal yellowish white, with narrow, wavy, pale-blue lines, and a large jet-black spot bordered with blue on membrane of last 5 rays; iris whitish.

Another specimen, also a male (field No. 03371), was, in life, livid gray, each scale posteriorly with a vertical spot of violet; anterior line of profile bright violet; a violet line downward from eye with a whitish area behind it on cheek; an oblique violet line downward and backward from opercular flap to behind axil; posterior to this a vague yellow area, behind which is an ovate white spot, each scale around which has a vertical bar of bright violet; above this a large black blotch washed with brick-red; dorsal bluish-gray, the rays posteriorly with an increasing amount of orange, where the blue is reduced to oblique crossbands, an intermarginal line of violet, a small black spot on last ray; membranes of second to fourth dorsal spines with a terminal black ocellus; anal pale golden, with oblique bluish stripes, a large jet-black ocellus bordered with blue on last rays; caudal pale orange, crossed by bluish lines; ventrals and pectoral pale.

Still another male example (field No. 03004) was described as follows: General color very pale, smoky white, edges of scales pale bluish, beneath seventh to ninth dorsal spines a large blotch, brick-red above, pale rosy below, all irregularly overlaid with black or brown; median line from tip of snout to base of first dorsal spine bright blue; a narrow bright blue line downward from anterior part of eye to angle of mouth; region above pectoral pale lemon-yellow, a short oblique pale blue line above base of pectoral; dorsal pale flesh-color, with short vertical bluish lines, 3 jet-black spots at tips of first, second, and fourth spines; anal pale yellowish, a black spot on distal half of last 3 rays; caudal pale, with obscure bluish cross-lines; pectoral and ventrals white; iris yellowish, red at lower posterior angle.

A female (field No. 03372), 7.5 inches long, from Honolulu, which is taken as a cotype, differed in life coloration from the male in lacking the black ocellus on the anal and in having more violet on the white lateral spot, also more golden before it; violet lines and spots obscure, but present; 3 to 8 small blackish points above lateral line behind black dorsal blotch; a small black ocellus on second to third dorsal spines and one on seventh, these wanting in some females; fins otherwise colored as in the males, but the blue fainter and the orange of dorsal brighter. Field No. 03005 differed in color from field No. 03004 only in the absence of black on the dorsal and anal fins, the paler blue lines on head, the paler caudal fin, and in having black spots on the back. Another female example (field No. 03271), 7.5 inches long, in life had the head and body smoky white; a large bluish white spot under tip of pectoral; snout bluish around border and surrounded by a broad pale yellow space involving nearly all of anterior half of side below level of eye; a large black spot under fifth to sixth dorsal spines, crossing lateral line and penetrating yellow of side, nearly reaching white spot; back of this a series of about a dozen small black specks, scattered along side above lateral line to near end of dorsal fin; median line of snout and head blue; dorsal pale, with wavy yellow cross-lines, pinkish toward margin; caudal pale; anal pale, with about a dozen pale yellow crossbars; pectoral and ventrals pale; iris yellow and red.

Color in alcohol, creamy yellowish white; head somewhat orange on cheek and opercles; faint rosy lines downward from eye to mouth and on preopercle; median line of anterior profile bluish; middle of back with a large black or brownish black blotch lying on lateral line, beneath which is a large white blotch under and above pectoral fin; anterior part of spinous dorsal blackish at edge, the color ocellated, rest of dorsal yellowish white with narrow purplish cross-lines; anal similar, with a large jet-black spot on last 4 rays; caudal color of soft dorsal; pectoral and ventrals yellowish white. One of the female cotypes (No. 03372) is pale olivaceous, the general color that of the male; dorsal with black spots on membranes of second, third to fourth, and eighth spines, the latter ocellated; a series of about a dozen small black spots back of the dorsal blotch on side above lateral line; no black spot on anal.

The differences in coloration are very marked in the 2 sexes. The male, in all specimens examined, has the jet-black spot upon the last rays of the anal, and this is not present in any of the females examined. The female always has a series of small black specks on the side above lateral line posterior to the large lateral blotch. These markings, the small black spots on the side of the female and the large jet-black spot on the anal of the male, would apparently always serve to distinguish the sexes. The extent of variation in color among individuals of the same sex is indicated in the color descriptions given above. We should have added that occasionally there is a small jet-black spot upon the last rays of the dorsal.

This is one of the most abundant and beautiful fishes found among the Hawaiian Islands. It appears to be related to *H. melanopus* of Bleeker, but differs from it markedly in the presence of the large black lateral blotch and in the absence of the large red lateral blotch shown in Bleeker's figure. The collection contains 42 excellent specimens, 40 from Honolulu and 2 from Hilo, ranging in length from 5.75 to 8.8 inches.

Hemipteronotus baldwini Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (April 11, 1903), 192, Honolulu.

266. Hemipteronotus jenkinsi Snyder. Plate 42, fig. 2.

Head, including opercular flap, 3.5 in length; depth 2.8; depth of caudal peduncle 2.2 in head; eye 6; width of interorbital space 5; length of maxillary 3; D. IX, 12; A. III, 12; lateral line 22+6.

Eye located 2.66 times its diameter above angle of mouth; mouth nearly horizontal, on a level with upper edge of base of pectoral, the maxillary extending to a vertical through anterior edge of orbit; lower jaw slightly longer than upper; lips with rather thin, fleshy folds; outer row of teeth strong, conical, those on sides of jaws posterior to canines gradually decreasing in size from before backward; canines curving outward and forward, the lower pair, which are slightly the larger, fitting between the upper ones; inner teeth short and blunt, in narrow bands; pseudobranchiæ present; gillrakers on the first arch 6+11, short and sharply pointed; edge of preopercle smooth.

Head naked, except for a narrow, vertical, scaled area extending downward from eye to a horizontal passing along edge of flap of upper lip; first row with 7 scales, curving upward behind eye; second row with 5, the third with 4; scales of breast about half as large as those on sides of body; scales 2-27-9; lateral line curving upward over first 6 scales, then following the dorsal contour, approaching the back near end of dorsal, discontinued after twenty-second scale, beginning again on third scale below and passing along middle of caudal peduncle; first 2 dorsal spines somewhat closer together than others, but not separated from them, the membrane being continuous; height of first spine 2.6 in head, the second shorter; remaining spines 4 in head; height of rays 2.9; end of soft dorsal when depressed just reaching base of caudal fin; anal spines small and slender, the rays equal in height to those of the dorsal; base of anal and also the tips of the rays when depressed extending farther posteriorly than corresponding parts of dorsal; caudal rounded, the basal fourth with scales, the length 1.6 in head; pectoral 1.5; outer rays of ventral filamentous, just reaching vent.

Color in spirits, head plain, without spots, bars, or lines; a conspicuous black spot on back covering 2 scales above sixteenth in lateral line, its distance behind the opercular flap equal to distance between that point and tip of snout; a yellowish white spot on side of body, rather indistinctly outlined, covering an area equal to width of 5 scales and height of 3 or 4, the spot partly covered by pectoral when depressed; scales of body, except on breast, belly, and part covered by the large light spot, each with a vertical pearly bar which grows wider on the ventral scales, covering over half the scale in region above base of anal; soft dorsal and anal with oblique dark bars, those of the anal not so broad as those of dorsal; caudal, pectorals, and ventrals plain.

This species is said to be readily distinguished from closely related Hawaiian forms by the great depth of the body and by the small dark spot, the posterior location of which is notable, but it seems to be a young female of *H. baldwini*.

Known only from the type, a specimen 1 inch long from Puako Bay, Hawaii.

Hemipteronotus jenkinsi Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 530, pl. 10, fig. 19, Puako Bay, Hawaii (type, No. 50879, U. S. N. M. Coll. Albatross).

Genus 167. XYRICHTHYS Cuvier & Valenciennes.

Body short, deep, and very greatly compressed; anterior dorsal outline parabolic and very trenchant; cheek scaleless; lateral line interrupted; first 2 dorsal spines removed but not detached from the third, the membrane between the second and third being moderately notched.

Xyrichtys Cuvier & Valenciennes, Hist. Nat. Poiss., XIV, 33 1839 (*cultratus*).

Xyrichtys Gill, Proc. Ac. Nat. Sci. Phila. 1862, 143 (*mundiceps*).

267. *Xyrichtys niveilatus* Jordan & Evermann. Fig. 142.

Head 3.3 in length; depth 2.4; eye 6.2 in head; snout 1.8; preorbital 2; maxillary 3; interorbital 4.7; D. II-VII, 12; A. III, 12; scales 3-28-8.

Body short, deep, and very greatly compressed; anterior profile nearly vertical from tip of upper jaw to front of eye, thence in a parabolic curve to dorsal fin; anterior dorsal outline very trenchant; body tapering rather evenly from head to caudal peduncle, which is greatly compressed and very deep, depth at middle equaling preorbital; head short; snout very short and blunt; mouth small, horizontal, the maxillary nearly reaching anterior edge of orbit; jaws equal, each with a pair of strong curved canines in front, and a single series of smaller, conic teeth laterally, the canines of lower jaw most prominent and extending in front of upper jaw; eye small, high up; the interorbital space narrow and trenchant; opercles smooth, without spines or serrations, ending in thin flexible edges; preorbital vertical and very deep; origin of dorsal fin above posterior line of orbit, far in advance of base of ventrals; first 2 dorsal spines somewhat removed but not detached from third, the membrane between second and third spines moderately notched, length of second spine about 2.7 in head, remaining dorsal spines subequal, weak, about equal to gape; dorsal rays low, the last few somewhat produced, their length 3 in head; anal similar to soft dorsal; caudal short, slightly convex, rays about equal to preor-

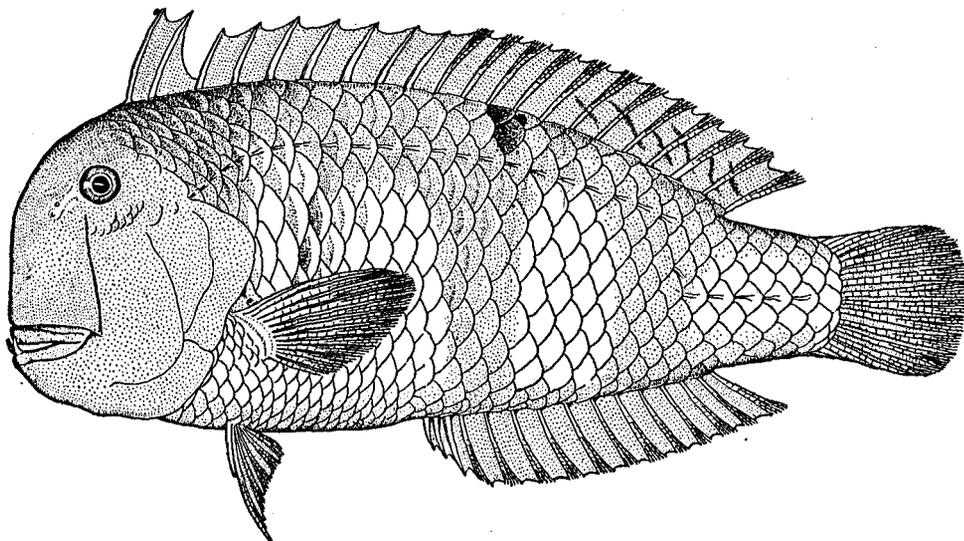


FIG. 142.—*Xyrichtys niveilatus* Jordan & Evermann; from the type.

bital; outer ray of ventral somewhat produced, not reaching vent, its length equaling depth of preorbital; pectoral broad, its tip reaching vent, its length equaling distance from snout to edge of preopercle.

Scales large, thin, and with membranous edges, those on breast somewhat smaller; head entirely naked, except for a few small scales below the eye; lateral line beginning at upper end of gill-opening following closely the curvature of back to the scale under the last dorsal ray but 2, where it drops 3 scales and continues to base of caudal, the pores simple, rarely branched.

Color in life, grayish; each scale of posterior half of body with a large violet spot, more narrow and brighter near middle of body, the edge of each scale broadly golden-olive; a large golden area, anteriorly deep orange, above pectoral and on edge of opercle; behind this a large quadrate pure white area extending to tip of pectoral; a few scales in golden area with bright violet markings; head shaded with violet, a bright violet stripe downward from eye to behind angle of mouth; a lunate black area shaded with red just below front of soft dorsal; spinous dorsal violet-gray; edged with reddish; soft dorsal golden, with violet vermiculations at base; its edge orange; anal golden, with bluish vermiculations; caudal similar, with the bluish markings; pectoral faintly reddish; ventrals dirty white.

One of the cotypes, a male (field No. 03373), agreed in life coloration with the type except that behind the opercle is a golden area with the bright violet stripes across anterior basal part; behind

this a large milk-white patch beyond tip of pectoral; a violet border around the white, blackish above the yellow.

Color in alcohol, dirty yellowish white, dusky above; head with some purplish reflections; a thin purplish line downward from anterior edge of orbit to tip of maxillary, a similar but less distinct line, from humeral region downward to subopercle; a yellowish white blotch on side above base of pectoral, in the base of which are 2 or 3 small purplish spots; a large white area on middle of side under and above tip of pectoral, separated from the yellowish blotch by purplish brown on 2 or 3 scales; a black spot covering the larger part of 3 scales on side above lateral line under base of first 3 dorsal rays, back at base of last dorsal rays somewhat dusky; anterior portion of dorsal fin dusky olivaceous, soft dorsal, anal and caudal pale yellowish crossed by narrow, wavy, pale purplish lines; ventrals and pectoral plain yellowish white.

A handsome fish, rather common about Honolulu. The type and 5 cotypes, all from Honolulu, range from 6.5 to 9.75 inches in length.

Xyrichtys niveitatus Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (April 11, 1903), 194, Honolulu (type, No. 50646, U. S. Nat. Mus.).

Family LXX. SCARIDÆ.

Body oblong, moderately compressed, covered with large cycloid scales as in the *Labridæ*; mouth moderate, terminal; teeth in the jaws more or less coalescent, at least at the base; lower pharyngeals much enlarged, united in a concave or spoon-shaped body, their teeth broadest transversely and truncate, arranged in mosaic; dorsal continuous, its formula usually IX, 10; anal II, 9; 23 to 25 scales in the lateral line; vertebrae about 11+14=25; sexes similarly colored, and the coloration almost always brilliant; fin rays essentially the same throughout the group, and the squamation varying little except on the head.

Herbivorous fishes of the tropical seas, often of large size, especially abundant about coral reefs. Little valued as food in America, the flesh being soft and pasty; but highly prized among the natives of the Hawaiian Islands, especially when eaten raw. The species in the various genera are very closely related, being distinguished chiefly by the coloration and the dentition, both series of characters being highly specialized.

Sparisomatinae:

- a. Lower pharyngeal broader than long, flattish or basin-shaped; gill-membranes broadly joined to the isthmus, not forming a fold across it; lateral line subcontinuous; scales about head few and large, those on cheek in one row; lower jaw projecting; teeth whitish or rosy.
- b. Teeth in each jaw in 3 or 4 series, all imbricated in quincunx order on the dental plate, to which they are adnate by the posterior face; cutting edge of each jaw formed by teeth.
- c. Dorsal spines flexible; teeth more or less distinct, at least anteriorly..... *Calotomus*, p. 338
- cc. Dorsal spines stiff *Scaridea*, p. 343

Scarinae:

- aa. Lower pharyngeal spoon-shaped, much longer than broad; teeth of jaws fully coalesced, each jaw divided by a distinct median suture; gill-membranes forming a fold across the isthmus; dorsal spines flexible; lateral line interrupted behind, beginning again lower down on the peduncle of the tail; scales about the head rather numerous, those on cheeks in two or more series.
- d. Teeth pale, rosy or greenish..... *Calliodon*, p. 345
- dd. Teeth deep blue *Pseudoscarus*, p. 358

Genus 168. CALOTOMUS Gilbert.

Teeth distinct, equal, imbricated in regular oblique rows in both jaws, wholly concealing the dental plates, to the anterior edge of which they are affixed; cutting edge of each jaw formed by the outer teeth, the dental plate not reaching the edge, and visible only from within; lips double for a short distance only; scales of cheek in 1 row; lateral line continuous; base of dorsal and anal with scaly sheaths; dorsal spines 9, soft and flexible; gill-membranes broadly joined to isthmus.

Large species of the Pacific, allied to *Cryptotomus*, but differing in the arrangement of the teeth.

Calotomus Gilbert, Proc. U. S. Nat. Mus. 1890, 70 (*xenodon*).

- a. General color of body and fins blue; about 8 narrow white lines radiating from the eye *irradians*, p. 339
 aa. General color of body and fins grayish or brownish.
 b. Spinous dorsal without black spot between first and second spines *cyclurus*, p. 340
 bb. Spinous dorsal with a distinct black spot between first and second spines.
 c. Side somewhat mottled with lighter but without distinct spots or specks *sandvicensis*, p. 341
 cc. Side above lateral line with a series of about 5 roundish white spots as large as pupil; side below lateral line with about 10 or 12 large round white spots; numerous smaller spots and irregular markings scattered among those, *snyderi*, p. 342

268. *Calotomus irradians* Jenkins. Fig. 143.

Head 3.25 in length; depth 2.5; eye 6.75 in head; snout 2.5; preorbital 3.5; interorbital 4; D. ix, 10; A. iii, 9; P. 12; scales 2-25-5.

Body short, deep and compressed; dorsal outline strongly arched from tip of snout to origin of dorsal fin, slightly depressed in front of eyes, thence in a long, low curve to base of caudal peduncle; ventral outline similarly convex; least depth of caudal peduncle 2 in head; head short and deep, a little deeper than long; snout short, preorbital deep, not much oblique; mouth small, the gape not nearly reaching front of orbit, scarcely oblique, lying in axis of body; lower jaw slightly included; upper jaw with 3 series of strong imbricated but distinct teeth in front, the posterior 1 or 2 on each side remote, recurved and canine-like; lower jaw in front with about 4 or 5 series of teeth similar

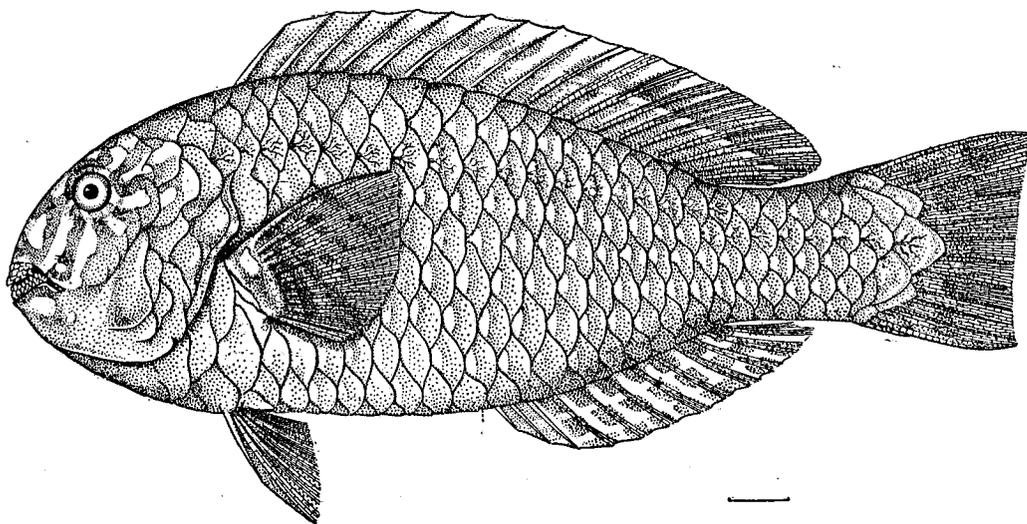


FIG. 143.—*Calotomus irradians* Jenkins; from the type.

to those in upper jaw; upper lip double only on the sides covering about half the teeth, lower lip not double; eye small, high up; interorbital rather narrow, convex.

Dorsal spines soft and flexible, their length about 3.25 in head; soft dorsal somewhat higher, rays about 2.3 in head; anal similar to soft dorsal, the rays equally high; caudal lunate, the lobes produced, the upper one the longer, about 1.3 in head; in some examples the caudal is more nearly truncate; ventrals short, their tips reaching scarcely halfway to origin of anal; pectoral broad, free edge slightly convex, the fin reaching slightly beyond tips of ventrals, length about 1.5 in head.

Scales large, firm, the edges thin and flexible; 4 scales on median line in front of dorsal fin; a sheath of modified scales along base of dorsal, a similar but lower sheath along base of anal; a single row of 5 large scales on cheek, 2 rows of large scales on opercle.

Color in life, body and fins blue; head, chin, and throat bright blue, marked with pink, in about 8 bands radiating from eye and a number of bands and irregular figures on snout, face and occiput, a few small spots on chin; of the pink bands radiating from eye, 2 reach region of angle of mouth, 2 join the irregular markings on face and occiput, and 4 radiate over the region of cheek and behind eye; a vertical bar of pink on each scale, in some regions partly concealed by overlapping

scales; vertical fins bright blue with reticulations and spots of pink; ventrals blue; pectorals blue, olive, and pink, sometimes spotted with olive-green and edged with white.

Color in spirits, pale yellowish or bluish-green, the bases of the scales darker, the edges bluish-white; top of head dark, vermiculated with brownish and greenish; side of head light bluish-green, about 8 narrow white lines radiating from eye, one forward and downward toward snout, another to angle of mouth, a third downward across preorbital and just above angle of mouth bending forward and connecting with second, next downward and backward toward edge of preopercle, the next backward from eye and curved slightly upward and the remaining 3 upward and backward from eye; side of nape and downward to opercle with a few small white spots; underparts of head rich bluish-green; dorsal blotched and barred with whitish, green and blue; caudal with irregular crossbars of whitish and bluish green, the outer rays green, the tip of the fin narrowly bordered with white; distal end of caudal peduncle brighter green; anal purplish and greenish, with irregular reticulating white areas near base; ventrals light dusky, scarcely barred; pectoral dusky greenish, darker at base and in axil, paler on distal portion. In some examples the general color is considerably darker brownish and the fins are much darker.

This species is known only from Honolulu, from which place we have examined 6 specimens 14 to 20 inches long.

Calotomus irradiatus Jenkins, Bull. U. S. Fish Comm., XIX, 1899 (Aug. 30, 1900), 58, fig. 15, Honolulu (Type, No. 12142, Stanford Univ. Coll. O. P. Jenkins); Jenkins, op. cit., XXII, 1902 (Sept. 23, 1903), 467 (Honolulu).

269. *Calotomus cyclurus* Jenkins. Fig. 144.

Head 3.1 in length; depth 2.5; eye 5.7 in head; snout 2.2; interorbital 4.2; D. ix, 11; A. i, 11; scales 2-24-5.

Body somewhat elongate, compressed, dorsal outline rising in a gently sloping, nearly straight line to origin of dorsal, from this point descending in nearly a straight line to caudal peduncle; ventral

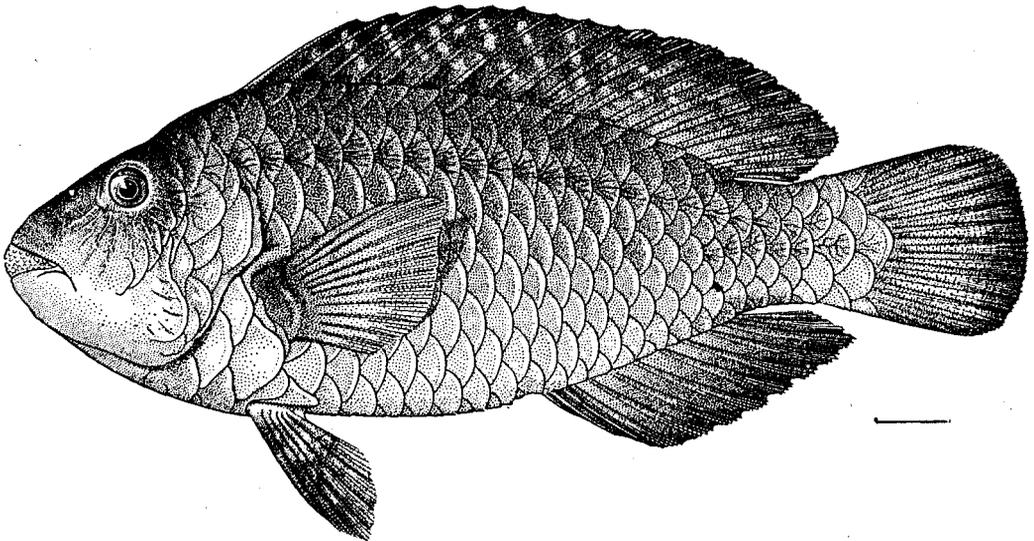


FIG. 144.—*Calotomus cyclurus* Jenkins; from the type.

outline about evenly convex; head a little longer than deep; snout long, bluntly conic; mouth large, horizontal, about in the axis of body; lips thin, double for about two-thirds the side, the lower double only a short distance; lower jaw just included; interorbital slightly convex, considerably broader than eye; least height of caudal peduncle a little less than half head.

Dorsal spines flexible, rather high, nearly half head; soft dorsal 2 in head; anal similar but less high, longest ray 2.3 in head; caudal rounded, no rays produced; ventrals 1.5 in head, reaching half-way to base of third soft anal ray; pectoral broad, its top reaching to or slightly past vertical through

tip of ventral, its length 1.4 in head (in the type there are 12 rays on right side and 9 on left, which is doubtless a deformity); distal border convex (on left side); origins of dorsal, pectorals, and ventral about in same vertical.

Scales large, firm, those on breast not reduced, those at base of dorsal hardly forming sheath, no sheath at base of anal; large scales on upper and posterior portion of the opercle, 1 row of about 7 scales below and behind the edge, remainder of head naked; lateral line complete, portion to the head parallel to the dorsal outline, straight portion beginning below base of fourth from last soft dorsal ray; 2 or 3 supernumerary scales, with tubes, extending from upper portion on the row just above straight portion, tubes much branched, the branching covering well the exposed portion of the scale; teeth in anterior portion of jaws distinct, pointed, imbricated in several series; 2 posterior canines; lateral teeth in upper jaw small, distinct, in a single series; lateral teeth in lower jaw large, in a single series; 2 conical teeth within the outer teeth at symphysis of upper jaw, other small teeth within the outer ones on sides of upper jaw.

Color in alcohol, head and body a uniform brown with some indications of dots of lighter on some of the scales, and a wide margin on the posterior border, each scale showing paler than the base; dorsal fin brown with faint traces of mottlings, no dark spot on anterior portion or darker margin; anal darker brown with less evident mottlings, and no darker margin; caudal much paler than body, upper and distal edges brown; ventral with indications of brown clouding; pectoral pale, without markings except that the base is dark brown; no markings on head except that top of head and isthmus are darker than sides of head. Description is based on a single specimen 15 inches long to tip of caudal, obtained at Honolulu by the *Albatross*, 1896.

This species appears to be similar to *Scarus spinidens* (*Callyodon waigiensis* Cuvier & Valenciennes, Hist. Nat. Poiss., Vol. XIV), a small species first described, very imperfectly, from the island of Waigiü. A specimen from this island has been identified by Bleeker as Cuvier & Valenciennes's species, which he designates as *Callyodon spinidens* and of which he gives a full description and a figure. The present species differs from Bleeker's description in the dorsal outline, in its greater depth, much smaller eye, longer snout, and much longer ventral, in not having scales on the lower limb of the opercle and in having the base of the anal dark. Dr. Bleeker had many (72) specimens, and found *C. spinidens* of a limited range in distribution.

Honolulu; only the type known.

Calotomus cyclurus Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 465, fig. 24, Honolulu (Type, No. 50849, U. S. N. M. Coll. Albatross, 1896).

270. *Calotomus sandvicensis* (Cuvier & Valenciennes). "*Ponuhunulu*."

Head 3.3 in length; depth 2.5; eye 6.4 in head; snout 2.5; preorbital 4; interorbital 4; D. x, 11; A. ii, 9; scales 2-24-5.

Body short, deep and compressed; dorsal and ventral outlines about equally convex, dorsal rising in a gentle curve from tip of snout to origin of dorsal fin, then in a long lower curve to base of caudal peduncle; head rather short; snout short, bluntly conic; mouth small, in axis of body, the lower jaw slightly included, each jaw provided anteriorly with about 3 irregular series of distinct imbricated incisor-like teeth; upper jaw with 2 strong backwardly directed canines on the side, lower jaw with a single series of small close-set teeth on the side; eye small, high up, the preorbital rather wide; interorbital high, convex; caudal peduncle moderately deep, about 2 in head.

Scales very large and thin; lateral line with a slight jog under base of last dorsal ray, the pores numerous branched; a single row of 4 scales on cheek, and 4 scales on anterior portion of opercle.

Dorsal spines soft and flexible, their length scarcely equaling that of snout; last dorsal rays somewhat elevated, their length nearly half that of head; anal similar to soft dorsal, its rays equally long; caudal somewhat lunate, the upper lobe usually the longer, about 1.2 in head; ventrals short, reaching half way to origin of anal; pectoral broad, the free edge convex, the upper rays about 1.4 in head. Description based chiefly upon specimen No. 05646.

Color in life (No. 03368), mottled gray and brown, scarcely reddish below; spinous dorsal with a black spot on membrane between first and second spines, a faint reddish stripe along base, and another along edge of dorsal fin; soft dorsal with pale reticulations around faint dark spots; caudal still more faintly mottled and with white edge, a blackish line before it; anal mottled brown with reddish shade at base and tip; pectoral yellowish, the base dusky; ventrals mottled dusky gray.

Another specimen (No. 03452) had, in life, the general color brown and olive with reddish along ventral portions of body and head; each scale with a group of irregularly-shaped gray dots; dorsal more olive, with reticulations of gray; black dorsal spot faint or obsolete; large dark blotch over distal half of last 5 rays of soft dorsal interrupted by gray spots; caudal reddish olive, crossed by irregular bands of gray; anal with reddish dark mottlings at base, with gray markings; ventrals reddish with gray markings; pectoral membranes transparent, the rays reddish olive; head colored like the body; under surface of pectoral at base black.

Color in alcohol (No. 03368) dull grayish or olivaceous on head and body, somewhat mottled with paler and darker brown, under parts grayish; side without distinct spots or specks; dorsal and anal blackish, with faint marblings of lighter; caudal obscurely barred with light and darker, the edge narrowly white; pectoral blackish at base, distally pale; ventrals dusky.

The numerous examples show considerable variation in color in spirits, chiefly with reference to the marbling of the dorsal and caudal fins. In many examples the mottling of these fins is quite distinct, while in others it is scarcely evident; some examples show all gradations between these two. The sides of body and head also are variously mottled gray. In some examples the body is very dark brown, the vertical fins almost black, and the pectoral black on its basal half.

The original description of *Callyodon sandwicensis* by Cuvier and Valenciennes, as well as a redescription by Valenciennes, is very incomplete, and except for the agreement in locality we would hesitate to consider ours the same species. This fact, however, makes the identification entirely reasonable.

The species is very common in the market at Honolulu, from which place we have 24 specimens. We have none from Hilo, but have 3 from Kailua. The length ranges from 5 to 14.75 inches.

Callyodon sandwicensis Cuvier & Valenciennes, Hist. Nat. Poiss., XIV, 295, 1839, Sandwich Islands (Coll. Quoy & Gaimard); Guichenot, Cat. Scarides, 62, 1865, in Mem. Soc. Imp. Sci. Cherbourg, XI (a redescription of type); Günther, Cat., IV, 213, 1862 (footnote).

Cryptotomus sandwicensis, Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 512 (Hawaiian Islands).

Calotomus sandwicensis, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 467 (Honolulu).

271. *Calotomus snyderi* Jenkins. Fig. 145.

Head 3.2 in length; depth 2.6; eye 5.6 in head; snout 2.8; preorbital 4.7; interorbital 4; D. ix, 10; A. iii, 10; P. 12; scales 2-25-6.

Body short, deep, and much compressed; dorsal outline rather straight from tip of snout to nape, from which point it is gently convex to origin of dorsal, thence in a long, low curve to base of caudal

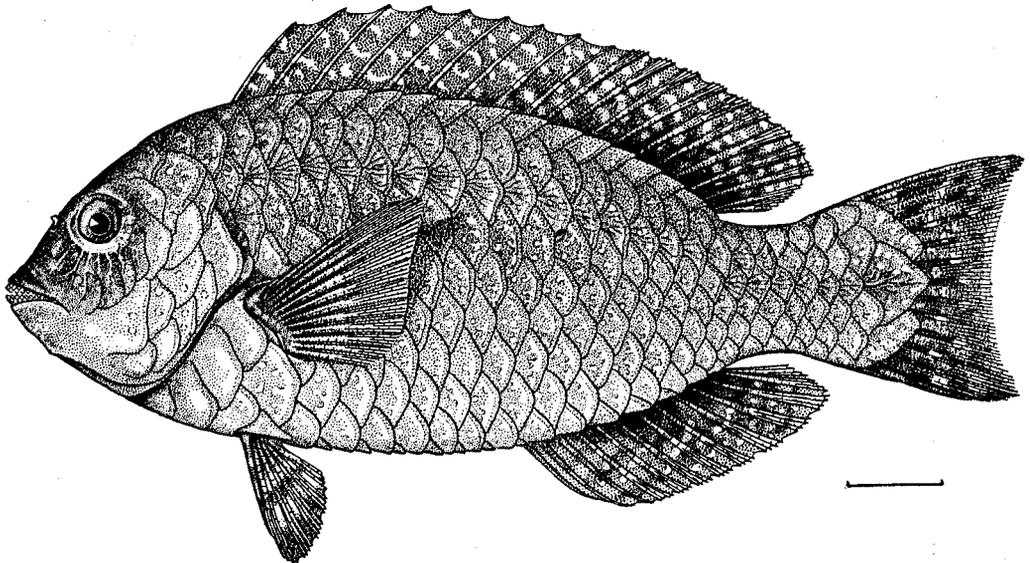


FIG. 145.—*Calotomus snyderi* Jenkins; from the type.

peduncle; ventral outline rather evenly convex; head short, as deep as long; snout bluntly conic, lower jaw slightly included; mouth small, in axis of body; teeth in front of each jaw free, convex, incisor-like, in 2 or 3 rows; upper jaw with 2 moderately strong, recurved canines, inside and posterior to which is a row of close-set smaller teeth; side of lower jaw with overlapping series of rounded incisor-like teeth; preorbital oblique, moderately deep; eye small, high up; interorbital broad, low, convex; caudal peduncle 2 in head.

Scales large, thin, adherent, the free edges membranous; 4 scales on median line in front of dorsal; cheek with a single row of 4 scales; opercle with 2 rows of large scales, 3 scales on the lower limb; lateral line complete, decurved under base of last dorsal ray, where there is usually one or more supernumerary pores; pores of lateral line numerous and widely branched, the branches varying from 4 or 5 to 12 or more.

Dorsal spines soft and flexible, the longest about equaling snout; soft dorsal somewhat elevated, the longest rays equaling distance from tip of snout to pupil; anal similar to soft dorsal; caudal somewhat lunate, the upper lobe the longer, about 1.8 in head; ventral short, reaching barely half way to origin of anal; pectoral broad, reaching past tips of ventrals, its length 1.3 in head.

Color in alcohol, dirty yellowish brown on head and body, marbled with light and darker; side above lateral line with a series of about 5 roundish white spots as large as pupil, and numerous smaller irregular, less distinct white spots; side below lateral line with about 10 or 12 large rounded white spots and numerous small white specks and irregular markings, these especially distinct in pectoral region; head with similar white specks and markings; dorsal fin brown with irregular paler spots; membrane between first and second dorsal spines black; soft dorsal with a large brownish black spot at base of last 5 or 6 rays; anal similar to soft dorsal, blotches not so distinct; a series of black blotches at bases of rays, the one on last ray larger than others, covering base of last membrane; ventrals brownish, dusky at tip, a paler interspace; pectoral dusky, dark at base and in axil, pale on tip.

The only specimen known is the type No. 50850, 10.5 inches long, obtained at Honolulu in 1889.

Calotomus snyderi Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 467, fig. 25, Honolulu (Type, No. 50850, U. S. Nat. Mus., field No. 1369).

Genus 169. SCARIDEA Jenkins.

Jaws subequal, the lower barely included; gill-membranes broadly joined to the isthmus, and not forming a fold across it; upper lip double for only about half its length; lateral line continuous; 1 row of scales on the cheek; teeth white, distinct in anterior portion of each jaw, in more than 1 series irregularly imbricated; lateral teeth in upper jaw small, in a single series, the tips free, the bases coalesced; lateral teeth in lower jaw large, distinct, but close-set, in a single series; posterior canines present; dorsal spines pungent.

This genus is related to *Calotomus* in the character of the teeth, but differs from it in having stiff, pungent dorsal spines, in this agreeing with *Sparisoma*. From *Scarichthys* Bleeker it differs in having pungent spines, in having the upper lip double for only a portion of its length, and in the distinct teeth. From *Callyodontichthys* Bleeker it is distinguished by the included lower jaw and the distinct teeth in upper jaw. Two species known.

Scaridea Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 468 (*zonarcha*).

a. Anal and caudal mottled; head comparatively long, 3 in length; eye large, 3.7 in head *zonarcha*, p. 343
 aa. Anal and caudal without mottling; head shorter, 3.25 in length; eye smaller, 5 in head *balia*, p. 344

272. *Scaridea zonarcha* Jenkins. Fig. 146.

Head 3 in length; depth 2.75; eye 3.7 in head; snout 2.6; mandible 3.7; interorbital 5; preorbital 5.6; D. ix, 9; A. ii, 9; P. 12; scales 2-24-5, 19 tubes before the bend.

Body compressed, the dorsal outline more convex than the ventral, the highest portion at third dorsal spine; head nearly as deep as long; mouth horizontal, in axis of body; lips thin, the upper double for only a part of its length, the lower double for only a short distance; lips covering only bases of teeth; eye moderate, its lower border above axis of body; interorbital somewhat narrower than eye, slightly convex; caudal peduncle 2.6 in head.

Jaws subequal, the lower slightly included; teeth white, distinct on anterior portion of each jaw and in more than 1 series, irregularly imbricated; lateral teeth in upper jaw small, in a single series,

outer extremities free, the bases coalesced; lateral teeth in lower jaw large, distinct, in a single series, crowded at base; 2 posterior teeth on one and one on the other side of upper jaw canine-like and turned backward.

Dorsal spines pungent, about 2.1 in head; soft dorsal slightly higher; anal similar to soft dorsal, but lower; caudal truncate or slightly rounded; pectoral 1.6 in head; reaching slightly beyond tips of ventrals; origins of dorsal, pectoral, and ventrals in same vertical line.

Scales large, firm, thin, those on nape and breast not reduced; 3 scales on median line in front of dorsal; 1 row of 3 scales on cheek; large scales on upper and posterior part of opercle, 1 scale showing on lower limb; rest of head naked; a sheath of scales at base of dorsal, none at base of anal; lateral line complete, the tubes much branched.

Color in alcohol, general ground-color of body and fins, except pectoral, light brown, with numerous scattered darker reddish brown spots, of indistinct outline, about size of pupil, these spots

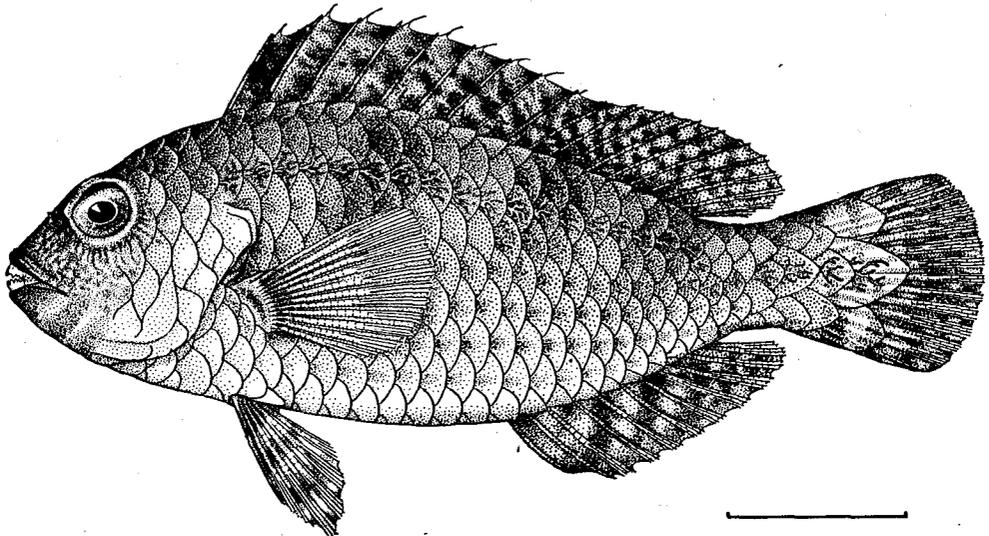


FIG. 146.—*Scaridea zonarcha* Jenkins; from the type.

on body corresponding with the rows of scales, and showing within their area small lighter specks; dorsal light brown with about 2 or 3 cross series of large darker brown spots, edge of fin blackish; anal and caudal similar to dorsal; ventrals mottled but lighter; pectoral pale, dusky at base.

Known only from 3 specimens obtained by Dr. Jenkins at Honolulu, in 1889, the length of these being from 4 to 5.75 inches.

Scaridea zonarcha Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 468, Honolulu (type, No. 50851, U. S. N. M.).

273. *Scaridea balia* Jenkins. Fig. 147.

Head 3.25 in length; depth 2.4; eye 5 in head; snout 2.9; preorbital 4; interorbital 4.3; scales 2-24-5; D. ix, 10; A. ii, 9; P. 12.

Body short, deep, and compressed; dorsal outline regularly and evenly arched from tip of snout to caudal peduncle, somewhat straighter from tip of snout to origin of dorsal fin, there being no angle at the last-mentioned point; ventral outline evenly convex; head short and deep; snout short; mouth moderate, about horizontal, in line with axis of body, the gape reaching past vertical from nostril; lower jaw included, each jaw with 2 irregular rows of teeth; teeth in anterior portion of each jaw distinct, imbricated in 2 irregular series; upper jaw with 2 posterior canines directed backward, lateral teeth of upper jaw distinct, small, and in a single series; each side of lower jaw with about 5 distinct blunt incisor-like teeth in a single series; no teeth inside of front series of upper jaw; preorbital and interorbital rather narrow, the latter little convex, somewhat concave anteriorly; dorsal spines stiff and pungent, length of longest about equal to snout; soft dorsal somewhat elevated, longest ray 2.1 in head; anal similar to soft dorsal, slightly lower; caudal rounded, 1.6 in head; ventrals short, their

tips reaching scarcely half way to origin of anal; pectoral short, free edge rounded, its length a little greater than that of ventrals.

Scales large; lateral line continuous from upper end of gill-opening to posterior end of dorsal fin, where it curves downward 2 rows, continuing to base of caudal fin; tubes of lateral line numerous and widely branched, the branches 4 to 6 or 7 in number, a few additional tubes at the bend of lateral line; one series of about 4 scales on cheek between which and eye are several long tubes; opercle with a series of large scales on basal portion; 4 scales on median line in front of dorsal fin.

Color in spirits, dirty rusty brown, paler below, upper part of side above lateral line with a series of about 6 roundish whitish spots larger than pupil; a similar series of about 4 spots on first row of scales below lateral line; lower part of side with 2 or more similar spots; side of head and body

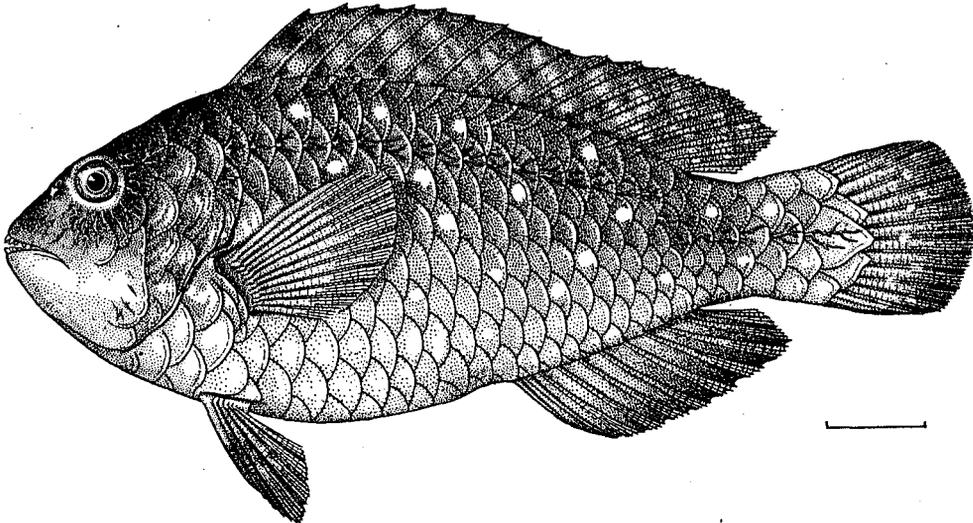


FIG. 147.—*Scarideia balia* Jenkins; from the type.

with a few scattered, smaller, less distinct whitish spots; dorsal fin indistinctly mottled with light and brownish; membrane between first and second spines blackish at the center; anal and caudal rather uniformly plain pale brownish without distinct markings; pectoral and ventrals lighter brownish; base of pectoral darker brown.

This species differs from *Scarideia zonarcha* in the greater depth of body, the much greater distance between tips of ventrals and origin of anal, the greater distinctness of the white spots on body, the less distinct mottling of the dorsal fin, and the entire absence of mottlings on anal and caudal.

The only specimen known is the type, No. 50852, U. S. National Museum (original No. 1985), 10 inches long, obtained by the *Albatross* at Honolulu in 1896.

Scarideia balia Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 469, Honolulu.

Genus 170. *CALLYODON* Gronow.

Lower pharyngeals spoon-shaped, ovate-oblong, transversely concave; teeth in each jaw fully coalescent, appearing as tessellations on the surface; jaws with distinct median suture; edges of jaw even, the teeth whitish, or rosy, in color; upper pharyngeals each with 2 rows of teeth; gill-membranes scarcely united to the narrow isthmus, across which they form a broad fold; dorsal spines flexible, scarcely different from the soft rays; upper lip laterally double, the interior fold becoming very narrow or obsolete mesially; lower jaw included in the closed mouth; lateral line interrupted posteriorly, beginning again on the next series of scales below; tubes of lateral line scarcely branched; scales on cheek in 2 to 4 rows; scales in front of dorsal on median line 6 to 8; dorsal ix, 10; anal iii, 9 in all species; scales $\frac{1}{2}$ -24-6; body robust.

Species very numerous, mostly of large size, found in nearly all tropical seas.

- Callyodon* Gronow, Museum Ichth., II, 1766, 8 (*croicensis*).
Scarus Forskål, Descr. Anim., etc., in Orient Observ., 1775, 25 (*psittacus*, etc.); not of Gronow, 1766, which = *Labrus* Linnaeus.
Calliodon Bloch & Schneider, Syst. Ichth., 312, 1801 (*lineatus*=*croicensis*).
Hemistoma Swainson, Class. Fishes, etc., II, 226, 1839 (*reticulatus* Swainson=*pepo* Bennett) (= *Scarus*).
Petronason Swainson, op. cit., (*psittacus*) (= *Scarus*).
Erychthys Swainson, op. cit., (*croicensis*).
Chlorurus Swainson, op. cit., 227 (*gibbus*) (= *Scarus*).
Callyodon Gronow, Systema, Ed. Gray, 83, 1854 (*lineatus*, etc.).
Scarus Jordan & Gilbert, Synopsis, 938, 1883 (*psittacus*).
Calliodon Jordan, Proc. U. S. Nat. Mus. 1886, 591 (*croicensis*).

- a. Upper jaw usually without posterior canines.
 b. Eye comparatively small, 6 or more in head.
 c. Eye very small, 8 or more in head.
 d. Head comparatively long, about 2.74 in length; eye 8 in head; interorbital 2.75 in head; general color reddish without bars or markings on fins or scales, excepting a narrow violet line on outer margin of dorsal and anal *miniatus*, p. 346
 dd. Head shorter, about 3.35 in length; eye 9; interorbital 2.35 in head; general color green, with bars or stripes on dorsal, and spots on scales of lower sides *perspicillatus*, p. 347
 cc. Eye larger, less than 8 in head.
 c. Preorbital comparatively wide, 4 in head; eye comparatively small, 5.6 in head *borborus*, p. 349
 ce. Preorbital narrower, 5 or more in head; eye larger, 6 or more in head.
 f. Body comparatively slender, depth about 3 in length; anal rays 9; general color gray or leaden.
 g. General color gray, streaked and barred; eye 6.2 in head; caudal lunate, the outer rays somewhat produced. *brunneus*, p. 349
 gg. General body color uniformly leaden, without streaks or bars; eye 6 in head; caudal truncate or slightly lunate, the outer rays scarcely produced *dubius*, p. 350
 ff. Body deeper, depth 2.34 in length; anal rays 10; general color brownish *ahula*, p. 351
 bb. Eye larger, less than 6 in head.
 h. Body comparatively slender, depth 3.25 in length; eye 5.2 in head; 2 rather distinct white stripes from near base of pectoral along lower part of side, disappearing before reaching vertical of anal origin. *bennetti*, p. 352
 hh. Body deeper, depth 2.8 in length; eye 5.5 in head; no white stripes as above *paluca*, p. 352
 aa. Upper jaw with canines usually present.
 i. Dental plates not conspicuously colored; whitish, not green or rosy.
 j. Caudal truncate or moderately lunate, the outer rays not much produced.
 k. Dorsal green at base and along the edge, the middle translucent; pectorals and ventrals green. *jenkinsi*, p. 353
 kk. Colors not as above.
 l. Upper jaw with 2 posterior canines, 1 on lower jaw; caudal moderately lunate *gilberti*, p. 354
 ll. Upper jaw with 1 small posterior canine, none on lower jaw; caudal truncate *formosus*, p. 355
 jj. Caudal deeply lunate, the outer rays considerably produced *laucia*, p. 355
 ii. Dental plates conspicuously colored, green or rosy.
 m. Dental plates rosy; color bands on head green or absent; pectorals not yellow.
 n. Posterior canines 2; general body color green; caudal with color bands, outer rays produced. *bataviensis*, p. 356
 mn. Posterior canines 1; general color violet-olive; no color bands on caudal; the fin rounded, outer rays not produced *erythrodon*, p. 357

274. *Callyodon miniatus* (Jenkins). "Uhu." Fig. 148.

Head 2.74 in length; depth 2.6; eye 8 in head; snout 2.2; preorbital 4; interorbital 2.75; D. ix, 10; A. iii, 9; P. 14; scales 2-24-6.

Body deep and compressed; dorsal profile quite evenly convex from tip of snout to base of caudal peduncle; ventral outline scarcely less convex; head large, heavy, and deep; snout very blunt, but long; mouth small, in axis of body; jaws subequal, the lower slightly included; teeth white dusky yellowish at base; posterior tooth scarcely developed, usually not evident; upper lip double only posteriorly, only covering about half the dental plate, lower lip narrow, not covering half the dental plate; cheek with 2 rows of scales, 6 scales in the upper and only 1 or 2 in the lower row, these latter small and sometimes not apparent; in old individuals the cheek scales are embedded and scarcely visible; no scales on lower limb of preopercle; a series of scales on margin of opercle, those on lower limb more or less embedded; 4 scales on median line in front of dorsal; lateral line interrupted under base of last but 1 dorsal ray, reappearing 2 scales below and continuing to caudal; tubes of lateral line much branched.

Dorsal spines soft and flexible, their length about 4 in head; dorsal rays somewhat elevated, the longest 2.7 in head; anal high, similar to soft dorsal; caudal slightly lunate in adult, truncate in the young, the lobes rounded, not produced; ventrals short, about 2 in head; pectorals longer, the free edge oblique, 1.5 in head, the breadth one-third its length, membranes of spinous dorsal, anal, and ventral fleshy.

Color in life, body, head, and fins all dull red, becoming a lighter red on lower parts and darker to a dusky reddish brown on upper portion of body; no distinct markings anywhere except a narrow violet line on outer margin of dorsal and anal fins; iris brown. Another specimen (No. 03365) was in

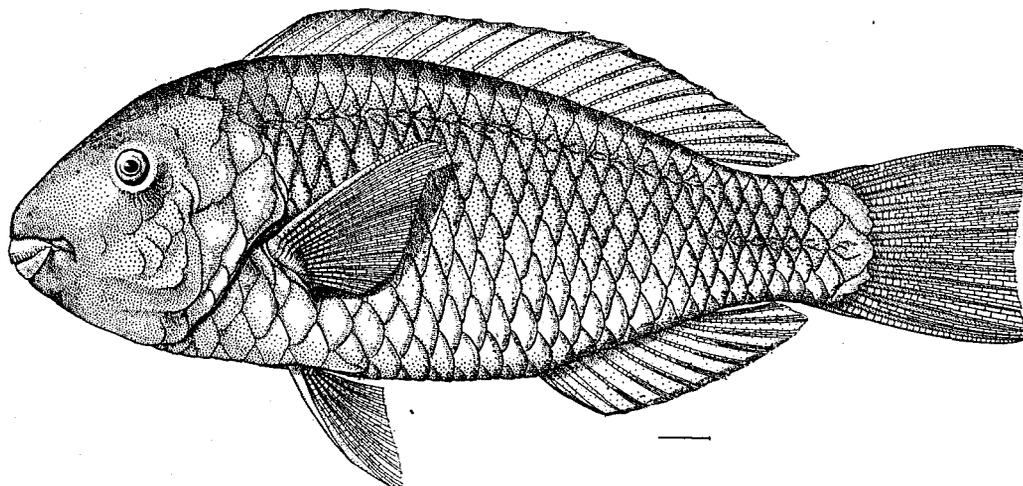


FIG. 148.—*Callyodon mimatus* (Jenkins); from the type.

life brown washed with red; basal half of all the fins brown red, distal half paler, of a bright pink, this especially true of caudal and anal; ventrals pink like the breast.

In alcohol the color fades to a dull dusky or reddish brown, the caudal peduncle paler; the fins all pale dusky yellowish.

This is one of the largest and most important species of this genus in Hawaiian waters. It is not very common and brings an extravagant price in the markets, being eaten raw at native feasts or "luaus." The collection contains a dozen specimens, 5.5 to 19 inches long, all from Honolulu.

Scarus mimatus Jenkins, Bull. U. S. Fish Comm., XIX, 1899 (Aug. 30, 1900), 62, fig. 20, Honolulu (type, No. 12144, Stanford Univ.; coll. O. P. Jenkins); *ibid.*, XXII, 1902 (Sept. 23, 1903), 470 (Honolulu).

275. *Callyodon perspicillatus* (Steindachner). "Uhu uli uli." Fig. 149.

Head 3.1 in length; depth 2.9; eye 9 in head; snout 2.2; interorbital 2.35; D. ix, 10; A. ii, 10 (9 or 10); scales 2-24-6.

Body short, stout and compressed; dorsal and ventral outlines about evenly arched; head as deep as long, compressed; snout very blunt, its anterior profile perpendicular, as high as long; no canine teeth evident; eye high, median; caudal peduncle deep, 2 in head.

Fins moderate, origin of dorsal over upper base of pectoral, rays higher than spines, last ray but one longest, 2.5 in head; last anal ray slightly the longer, last but one 2.2 in head; caudal very slightly lunate; ventrals not reaching vent by half their length; longest ray 1.8 in head; pectoral broadly falcate, longest ray 1.3 in head.

Scales large and thin; 4 scales before dorsal, a single row of 5 scales on preopercle, a single scale under the last posterior scale in the row, lower edge of preopercle with a single row of large scales; 3 rows of large scales on opercle; last scale of lateral line very broad and large, more than half the width of caudal peduncle and much the largest scale on the fish; 4 scales in front of ventrals; lateral line following curvature of back to the row of scales except one under the last dorsal ray, then dropping down 1 row and continuing on middle of caudal peduncle to base of caudal; pores with 2 tubes generally, sometimes with 3 or more.

Color in life (No. 03367), vitriol green, each scale on sides edged with brown-drab; belly livid lavender drab, the scales with small round blue spots on side as far up as pectoral; a gray drab area behind head reaching nearly to end of pectoral, covered with small blue spots and navy blue streaks; lower part of head violet with elaborate sky-blue markings, opercular flap bright golden green, stripe and ring about eye blue; snout violet, then brown with a light green area bordered by sky blue, then a golden brown area similarly bordered; dorsal with 2 stripes of bluish green, 2 of golden brown, the edge clear blue; caudal clear blue, the rays dusky; anal like dorsal, the stripes broader; pectoral light blue, the upper rays and a stripe across base bright blue; a golden brown shade at base; caudal bright golden brown, the outer and inner rays bright blue.

Color in spirits, body bright greenish, edges of the scales purplish, under parts paler, postocular region, upper half of opercle and region under and above pectoral purplish with numerous small round green spots, those on posterior portion of area modified into irregular green lines; snout purplish; a broad purplish saddle bounded by a narrow blue-green border over middle portion of snout reaching level of mouth on each side; a narrow blue-green line connecting eyes and extending around front of eye and backward upon cheek for an eye's diameter; 2 short postorbital blue-green streaks; 2 or 3 curved green streaks on cheek; lower lip with a broad blue-green border covering entire width

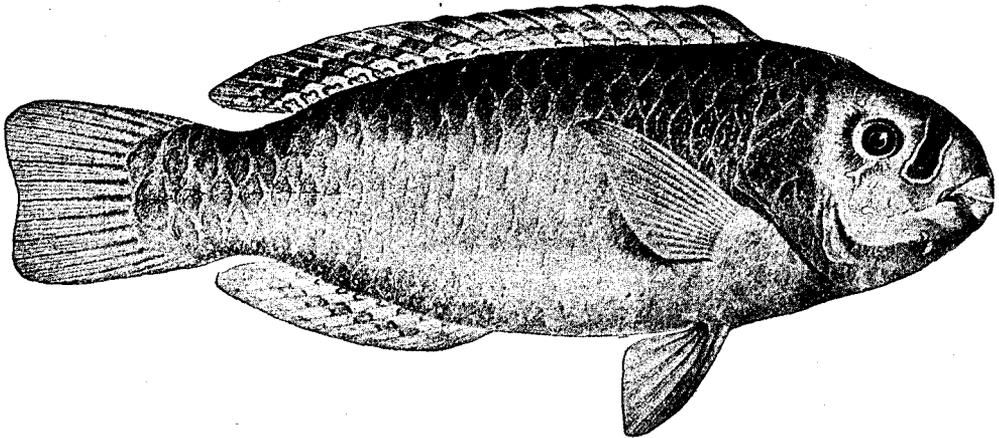


FIG. 149.—*Callyodon perspicillatus* (Steindachner); after Steindachner.

back to bases of branchiostegals, bending upward to angle of snout, and then continuing upward and backward across cheek in a wavy blue-green stripe; a narrow stripe of same color beginning on side of head, under this continuing downward and backward to near edge of subopercle, where it turns backward, inclosing 3 small areas and then extends upward along edge of preopercle to middle of cheek; middle line of branchiostegal membranes blue-green; a few thin green streaks and spots under base of pectoral; dorsal fin with a scallopy blue-green base, a median stripe and a border of same color, the median stripe separating 2 yellowish purple or whitish stripes; anal similar, the basal blue-green streak narrower and broken up into scallopy spots, the median green streak much broader, the green border also broken; caudal bluish green, the edges brightest; ventrals creamy white, the edges pale green, the inner edge narrowly blue-green; pectoral purplish dusky, upper edge bright blue-green.

This is one of the largest and most beautiful species of *Scaridae* occurring among the Hawaiian Islands. It reaches a length of nearly 2 feet, is fairly common, and is highly esteemed by the natives. We have 6 specimens from Honolulu and the *Albatross* secured it at Puako Bay. It is known also from Johnston Island.

Scarus (*Scarus*) *perspicillatus* Steindachner, Denks. Ak. Wiss. Wien, XLI, 16, pl. IV, fig. 1, 1879, Sandwich Islands.

Scarus perspicillatus, Smith & Swain, Proc. U. S. Nat. Mus. 1882, 134 (Johnston Island); Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 470 (Honolulu). Snyder, op. cit., XXII, 1902 (Jan. 19, 1904), 531 (Puako Bay).

276. *Callyodon borborus* (Jordan & Evermann). "Panuhu." Fig. 150.

Head 3.2 in length; depth 3.2; eye 6.6 in head; snout 2.9; interorbital 2.9; preorbital 4; D. 1x, 10; A. III, 9; P. 14; scales 2-25-6.

Body oblong, not very deep nor greatly compressed; head about as long as deep, conic, compressed; snout short, blunt and rounded; upper jaw produced, its lip double, covering entire dental plate; lower lip covering half of dental plate; no canine teeth; eye anterior, high, its lower border considerably above upper base of pectoral; caudal peduncle short and deep, its depth 2 in head.

Origin of dorsal over upper base of pectoral, spines flexible, short, not quite as long as rays; longest ray 2.1 in head; longest anal ray 2.2 in head; caudal truncate; ventrals 1.9 in head, not reaching vent by half their length; pectoral 1.5 in head. Scales large and thin, very slightly roughened by radiating lines of granulations extending to margins of scales; lateral line interrupted, the pores being on 18 scales, then dropping 2 rows to row of scales under posterior base of dorsal, and continuing to base of caudal on middle of caudal peduncle, 7 pores in the shorter part, which begins

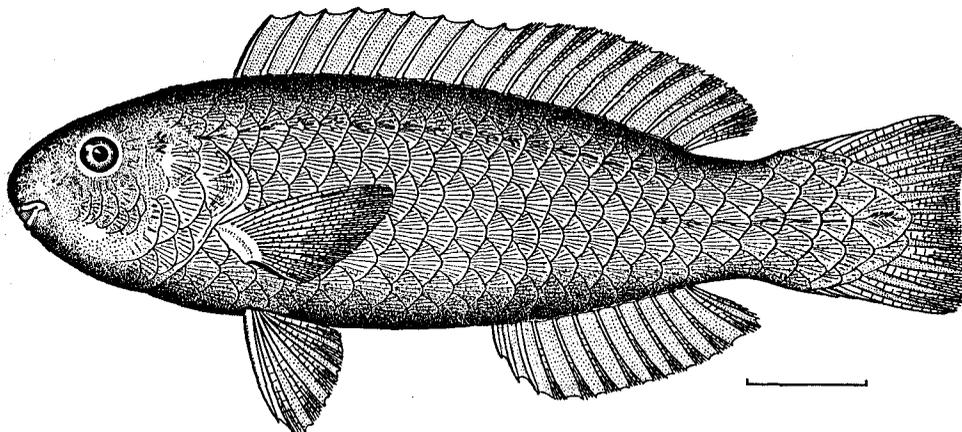


FIG. 150.—*Callyodon borborus* (Jordan & Evermann); from the type.

on the row following the row on which the upper part ends, there not being 2 pores in the same row; scales extending well out on the caudal, the last scale of lateral line very large and thin, being the largest scale on the fish; 4 scales in median line before dorsal; 2 rows of scales on cheek, 5 scales in upper row and 2 to 4 in lower, sometimes only 2 on posterior part; 2 rows on opercle, and 1 on lower margin.

Color in alcohol, grayish leaden brown, lighter below; no markings on fins different from corresponding parts of body.

The above description is based on the type, No. 50649, U. S. N. M. (field No. 04316), a specimen 7.75 inches long, from Honolulu; cotype, No. 27.35, U. S. F. C. (field No. 04354), 7.5 inches long, and cotype, No. 7465, L. S. Jr. Univ. Mus. (field No. 650), 5.5 inches long, both from Honolulu.

Scarus barborusa Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (April 11, 1903), 197, Honolulu.

277. *Callyodon brunneus* (Jenkins). Fig. 151.

Head 3 in length; depth 3; eye 6.2 in head; snout 3; preorbital 5.2; interorbital 3; D. 1x, 10; A. III, 9; P. 13; V. 6; scales 2-25-6.

Body short, deep and moderately compressed; dorsal and ventral profiles about equally convex; head short and moderately deep; snout bluntly pointed; mouth small, in axis of body, about horizontal, lower jaw slightly included; teeth white, posterior canine in upper jaw occasionally but not usually present; upper lip double for its whole length, almost wholly covering upper dental plate; lower lip covering more than half of dental plate; eye small, the lower edge of orbit on axis of body; interorbital space broad, gently convex.

Scales large, 4 rows in front of origin of dorsal, cheek with 2 rows of scales, 6 in the upper and 4 in the lower, anterior limb of opercle without scales, a row of scales along margin of opercle; lateral line interrupted under base of last dorsal ray, reappearing 2 rows farther down, 18 pores in the first part and 8 in the other, the tubes somewhat branched.

Dorsal spines soft and flexible, low, their length 3.5 in head; dorsal rays not elevated, the edge of the fin gently rounded; anal similar to soft dorsal, the rays shorter than snout; caudal lunate, outer rays somewhat produced, about 1.7 in head; ventrals short, about equaling snout and eye; pectoral longer, reaching past tips of ventrals, its length 1.4 in head.

Color in life, gray mottled, streaked scored and barred with gray and brown; reddish-brown bar on lower jaw; some reddish on belly, ventral fins, and front of anal; vent blue; pectoral dull yellowish, a black bar at its base; tip of caudal white; no bright colors; dark behind eye, a dark scale on opercle.

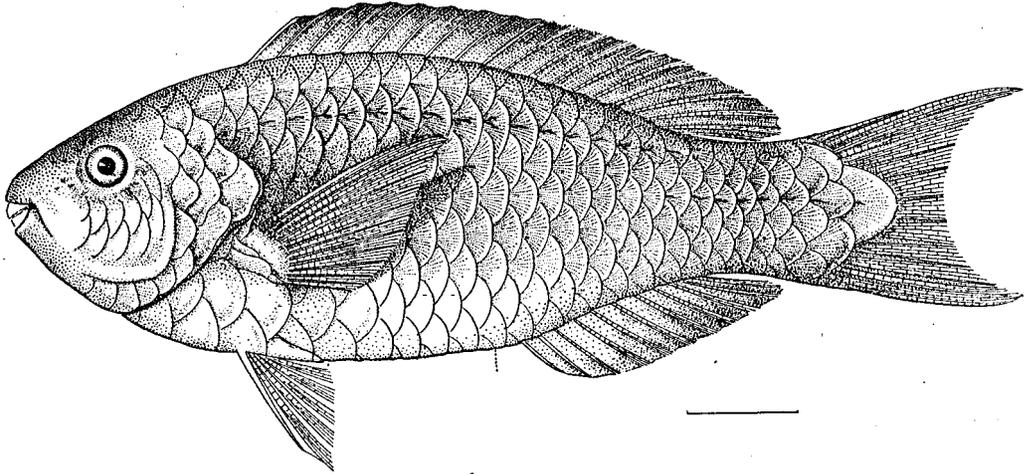


FIG. 151.—*Callyodon brunneus* (Jenkins); from the type.

Another specimen when fresh was dirty mottled brown, scales with coppery-red below; dorsal like back; caudal and anal more reddish, vaguely mottled; ventral coppery, and pectoral colorless, a dark bar across base.

Color in spirits dark rusty brown mottled and blotched with darker and paler; dorsal and anal dark purplish brown.

This species reaches a length of about 10 or 12 inches, and is not uncommon in the markets of Honolulu.

We have examined 15 specimens, all from Honolulu, 7 collected by Dr. Jenkins, 1 by the *Albatross* in 1896, 1 by Dr. Wood, and 6 by us. The length varies from 4.25 to 9.5 inches.

Scarus brunneus Jenkins, Bull. U. S. Fish. Comm., XIX, 1899 (Aug. 30, 1900), 59, fig. 16, Honolulu (type, No. 6139, Stanford Univ. Coll., O. P. Jenkins); *ibid.*, XXII, 1902 (Sept. 23, 1903), 470 (Honolulu).

278. *Callyodon dubius* (Bennett). Plate 44.^a

Head 3.1 in length; depth 3.1; eye 6 in head; snout 3; preorbital 5; interorbital 3.2; D. ix, 10; A. iii, 9; P. 14; scales 2-25-6.

Body short, stout, not deep and not greatly compressed; head short and blunt; snout short; anterior profile evenly curved from tip of snout to origin of dorsal; ventral outline less convex; mouth small, horizontal, slightly below axis of body, lower jaw included; upper lip entirely covering upper dental plate, lower lip leaving a portion of lower dental plate exposed; no posterior canine in either jaw; teeth white; eye small, lower edge of orbit in line with axis of body; interorbital space wide, broadly convex.

Scales large, 4 rows on median line in front of dorsal; cheek with 2 rows, 8 scales in the upper and 3 in the lower, subopercle with a single row; opercle with a single row of large scales; lateral line

^a*Scarus dubius* on plate.